



## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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Dr. Leenard Hill of the London Hospital is conducting a series of experiments to determine how much barder a man

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NEW YORK SATURDAY JANUARY 1st 1910

The Ed tor is always g at it receive for examination illustrated articles on subjects of it sely interest. If the phots graphs are short, the articles of set and the facts cathendie, the contribut one will receive appeals attention. Accepted articles will be positively on get for at rear g researches.

### RETROSPECT OF THE YEAR 1909 Exploration

The year 1909 will forever be famous in the annals of scientific accomplishment as having witnessed the successful culmination of the age long quest for the North Pole and the achievement of Commander Roll ert E Peary of the United States navy in finally reach ing this theoretical point at the dome of the world ing this theoretical point at the dome of the world after twenty three years of practically uninterrupted endeavor will stand as the most difficult feat of geographical exploration in the history of the world it was eminently fitting that Peary about the first to reach the North Pole for among all the Arctic explorers he was easily the first in practical procedures as the procedure of the proce knowledge and experience When he announced to the world on September 5th that on April 6th 1909 he had reached the covered goal his word was accepted with out question Sibsequently his data was passed upon Throughly by the National Geographic Scotety of America which later presented him with its medal and the verdict of this tribunal has been tacitly indorsed by the various learned societies throughout the world

In our issue of September 11th commenting upon the freely expressed doubts of Dr Cooks claim that the freely expressed doubts of Dr Cooks claim that he also and a year earlier had reached the North Pole we wrote The man who can look Death full in the face throughout all the cruel sufferings of a two years search for the secret of the frozen North is built upon lines too noble to admit of the slightest subterfuge or misrepresentation. It was evidently with the same conviction that the Danish authorities and the Danish people at large accepted Dr Cooks stupendous claim in a spirit of loyal belief which superanous caim in a spirit of toyal belief which appears never to have wavered until the flasto of the receipt of his so-called data by a committee of the University of Copenhagen. These gentlemen very quickly reported that Cook's statement was the same as that printed in a New York newspaper that the copy of his notebooks contained no original astronom ical observations whatsoever but only results that the documents presented were inexcusably lacking i information which would prove that the astronomical observations therein referred to were really made and that they contained no details regarding the practical work of the expedition and the sledge journey which would enable the committee to determine their relightlity

By this sweeping repudiation of Dr Cooks claims the University of copenhagen has drawn the final cur-tain upon one of the most spectacular dramas of auda clous imposture in the history of geographical re-

Second only in importance to Peary's achievement in eaching the North Pole was Lieut Shackletons we derful journey in the Antarctic when he succeeded in reaching latitude 88 degrees 28 minutes south and arrived within 111 miles of the South Pole Shackleton passed the very point reached by Scott in 1903 pushed on for 325 miles and was defeated in his ques pushed on for 125 miles and was defeated in his quast by hunger frique sickness and the loss of his dogs and ponies. He discovered eight new and distinct mountain ranges and over one hundred mountains and ascended Mount Erebus the most southerly vol-cano. The south magnetic pole was resched at 72 gagrees 10 minutes.

## Civil Engineering

With the single exception of the harbor at Dover the part year has not been notable for the completion of any engineering works of the first magnitude. This supendous work by which a harbor capable of float-

ing a whole first of the largest warships has been
"wrested from one of the storminet mas in the vorsit,
constate of an aggregate length of ever two miles of
breakwater much of which is nearly 100 feet in
height from its foundation to its creet It inclease
about one equare mile of area and cost some twenty
milton folders.

In spite of many predictions of failure the United States government through its army engineers, is building the Panama Canal with a rapidity which augurs well for its opening by January ist, 1915 Over augnra well for its opening or January In., 1910 over one half of the excavation at the Culebra cut has been done and if we include the work done by the French the out may be considered as two-thirds completed on the Atlantic side between three and four miles of the entrance channel have been completed and on the Parific side the channel is open to full depth for about five miles At Gatun the lock excavation is so far done that the laying of the concrete floor and the building of the walls is well under way and over eighty thousand cubic yards are already in place. The cut for the spillway has been completed and here concreting is making good progress. The method suilding the Gatun dam by hydraulic depositing is being followed with every promise of securing a per fectly watertight structure The locks which will be in pairs will be 110 feet in width with a usable length They will be provided with an extra pair of heavy mitering gates to act as collision bulk heads. Plans have been completed for an emergency dam at the head of the locks which in the event of dam at the head of the locks which in the event of a gate being carried wary will be symma arous the entrance and wickets resting on girders extending from the bridge to sills below will be associately low ered until the flow of water is cut off Throughout the whole length of the canal the method of excernation by stoam shorel has been ominently successful and during the month of March a maximum record of excernition was reached of 1880 off 10th yards. The health oon was reached of 2880 487 tubb, yards The health con-ditions have shown steady improvement and the rate of sickness and mortality is now less than in some parts of the United States The increasing size of ships both merchant marite and naval has led the German government to undertake a great colargement of the Kaiser Withelm Canal which is to be despi-and to 16 feet. With provision for a later desputing if necessary to 46 feet. The width of the small is to be doubble and the locks will be 147 feet broad 46 feet deep and 1082 feet long During the year work has progressed steadily if somewhat slowly upon that other great work of canal excavation known as the New York State Barge Canal While it must be ad mitted that there can be no comparison on the score
of accommodation between a canal 12 feet in depth with one 45 feet deep it must be remembered that whereas the Panama Canal is but 50 miles in length whereas the Pansam Canal is not by miss in length from deep water to deep water the New York Barge Canal extends for nearly 400 miles On June 23nd the first sod was turned in the work of cutting the Cape Cod Canal which will extend for eight miles from Barnstable Bay to Bussard's Bay It will have a sur face width of 300 feet a least depth of 25 feet and a high water depth of about 30 feet. The sailing dis-tance between New York and Boston will be shortened and vessels will avoid the perils of the outside trip and vessels will avoid the perils of the outside trip around Cape Cod Furthermore it will serve as the first link in a chain of interior waterways by way of Long Island Sound New York Bay and the Baritan and Delaware Rivers to Chesapeake Bay. During the year the agitation for the construction of a waterway from the Lakes to the Guif has been exceedingly attacked authory the advocates of this great scheme were dis-couraged by an adverse report of the board of govern ment augineers appointed to investigate the problem This board reported that although the construction a 14 feet channel was feasible there was not suffer a 14 foot channel was feasible there was not emfloset traffic in sight to warrant the expenditure of the \$100,000,000 that the whole project would feat The street Los Angeles Aqueduct which contains of the Panama and State Barray canals is the largest by Tenanic angiestering work in progress is now about habit concepturing work in progress is now about habit concepturing work in progress is now about habit concepturing work in progress in the street habit concepturing work in the progress is not about habit concepturing 200,000 to galaxies of water part day. The property is 200,000 to galaxies of water part day. from the Sierra Nevada Mountains over the Mejave Desert to San Fernando Valley where it will provide water for city supply for power and for irrigation.

Throughout the year the work of the United States

The substitution of the following state of the work on control to the following state of th

which has been driven through the cosentales and in new being used to diver the Giuninos River little the furtile Uncomplays Valley.

The hereulean tests of howing out of the solid rook of Manhattan Island the assoled spales for two of the larguest relivery terminal stations in excisence, and building within and upon them dequate tests aped and terminal accommodation has proceeded appear during the past year. The Fenneylvanial Terminal is precinally completed as are also the commerciar tra-sis with New Ferrey and Long Island. The present open for public use early in the summer of this year to work of contraction which had been temporarily all but suppended on the New York Central Terminal has been proceeded with new larger during 1000 that has been prosecuted with such vigor during 1909 that all but two tracks of the old train shed have been re-moved and the rock excavated to about 45 feet below moved and the rock examined to about 45 feet below the street level It is greatly to the credit of the engineers and contractors that the gradual transfer of transis from the old to the new Ireal has been made without the elighteet interference with traffer. The difficulties of the work ands it likely that three pears with chapes before it is entitlely completed. The exten-tion of the complete of the complete of the complete and the complete of the complete of the complete in the complete of the complete of the complete in its entirety the downtown tunnels from Jerny City. To Cortlanti Storet having been put in service during In its antirety the downtown tunnels from Jersey City. Occasion of the Continued Street having been put in service during the year. A franchies has been granted to the company for an important extended from Static Arente and Staff Street to the Grand Cantral Station. This important connection will enable passengers from New England to the South and West to travel by rail from the Cantral Station. the Grand Central Station to the trunk line termi

stations in Jersey City
The close of the year witnesses the practical comple-tion of the Manhattan Suspension Bridge across the Bast River which is now spanned by four out of the five great ions gene bridges of the world the first being the notable Forth Bridge in Sociand The Manhattan Bridge which is of the suspension type has the larg est carrying capacity of any bridge in the world pro-vision being made for four rapid transit tracks four surface tracks one 35-foot roadway and two 11 foot footwalks. The main span measures 1470 foot and the pointed to examine into the question of the safety of the bridge pronounced this great structu thoroughly adequate to carry the loads imposed. The thoroughly adequate to carry the loads imposed. This structural modifications recommended by the commission which investigated the Queenabore Cartilever Bridge over the Beat Riter with a riw to decreasing the total dead and live load have been made and this involved and perfectly asis for the modified loading adopted. The commission of angineers which have the re-designing of the Queboo angineers which have the re-designing of the Queboo Bridge in hand are still at work upon the p ar yet no statement has been made either as to the character or capacity of the new bridge although we understand that there is a possibility of the suspen ston type being adopted in preference to the canti-lever—a was substitution

### Naval and Military.

Progress during the past year in matters naval and military may be considered as decidedly satisfactory Several ships have been completed chief among which are the South Carolina and Michigan the first are the South Carolina and Michigan the first all biggens betterlies for or many. These vessels which are of 16 000 tons displacement carry each four the called 18 lines guar The Michigan on her official trial maintained an average speed of 18 97 knots. The Delaware and North Dekota freedomogsts of 50 000 tons displacement carrying each ten 18-inch The Dalaware and North Dalcots dreadnoughts of 3000 tone displacement carrying each test 18-inch 45-celliber game and fourteen School game have passed through their trials successfully the Dalcware' driven by reciprocating angines averaging at full proves a speed of 11 of kpots and the North Dalcots driven by Certification and the North Dalcots are not consumption of the turbina-driven ship at ernsiping speed to the three processing to the "Daylots and the "United States of the Speed and the "Thought and "Thoug

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gin to spars.

The new 1-14-nch 80-caliber type gun, of the kind which is to be mounted in our \$8,000-ton ships, has shown, in the Priving Ground tests, an initial velocity of 3,000 feet per second and a mustle energy of 5,500 feet per second and a mustle energy of 5,500 feet, per second and a mustle energy of 5,500 feet, per second and a mustle energy of 5,500 the how the heavy gun, recently completed at the hidden works, which will fire a 1,000-pound projectile with a mustle sourcey of 6,500 feet. The new army 1-61-of-th gun will be less powerful, but its accuracy life will a gun will be less powerful, but its accuracy life will be greater it will be capable of firing 250 rounds, as against 80 to 100 rounds which is the limit for the present high relocity 12-inch army gun. A compari-son of the sea strongth of the powers at the close of the past year places Great Britain first, the United States many third, France fourth, and Jape When all ships now building are completed, Germany will be second with \$20,892 tons, and the United State third with \$29,892 tons, and the United State third with \$29,887 tons displacement. In dresdnoughts Great Britain stands first with seven completed, and nine building, Germany second with two completed, and nine building, and the United States third with two completed, and four under construction Of predreadnought battleships carrying guns of 11 inch call-ber or over, Great Britain has forty nine, the United States, twenty-five, and Germany, fourteen.

### Merchant Marine

The deplorable decadence of our merchant marine has continued throughout the year, and we look in vain for any adequate evidence of the awakening of vam nor any acceptance of this pre-eminently na-tional question. As a measure of security and defense, the existence of an adequate number of merchant ables to serve as transports and colliers in time of war is tital to the efficiency of our navy Although, during the world cruise of our feet, the world looked on aptas worn cruise of our neet, the worn looked on ap-provingly and applicated this evidence of material strength, the people who know—the naval boards of strategy and naval officers in general—must have smiled as they realized that, because of our want of transports and colliers, a voyage of this character would never be seriously contemplated by our naval would never be seriously contempason by our board, and certainly never attempted. The signs of decadence of our merchant marins are so clearly writ-ten that he who runs may read. Within two years the number of American steamers crossing the Pr and capable of carrying the mails has b more than one-half. The year before last the Post Office Department recommended, and the Senate assed a bill providing for a compensation of so much or mile to steamers running to South America, the per mise to seemers running to South America, the Philippines, Apapa, China, and Australia, but the measure failed to become inv. It is certain that with-out such federal escouragement American stammhly lines will naver be established, and until the construc-tion of mail steamers and freighters is encouraged, our splendid navy will be robbed of its efficiency and itmited, at least in the opening months of a war, to

minuse, at sear in the opening months or a war, to the detense of its own ports.

The past year will be notable in the annals of trans-athanic traval for the fact that a transaliantic liner made the passage for the first time at an average speed of 36 knots an hour. This was accomplished bilt October, when the "Mauretania" covered the westhist October, when the "Hauretanist" correct the weat-ward course from made to lead in 4 days, 10 hours, and 11 phrotos, at an average apped of \$4.00 knots. Both 5th resists and ler sitest, it. Touristanis, "are now objects of \$2 hours sessioned speed in average weather and \$5% knots, foreign the quiet weather of the sum-session of \$10 knots sessioned speed in average weather \$10 knots, for \$2 knots sessioned appeal in proceeded again, \$10 knots, and \$2 knots, and also will projectly should, the "Victoria" and "Ultrapple," has proceeded and will projectly saidly her first trip \$1.910. The dissen-sions of these both, as a phenomial for \$50 coursilor, are: 100 first order \$50, \$20 knots, and as the property of the said of the said of the said of the \$10 knots of the \$10 knots of \$10 knots of the \$10 knots of the light speed of \$10 knots of the \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots of \$10 knots of the hallow-ted said \$10 knots of \$10 knots

enditution of four-bladed propellers of smaller diam-er for three-bladed propellers on the outer shafts of the Cunarders has not only completely eliminated controllecture may be a first comparison to the considerably increased the speed. There is no ordences that any company will intempt to rival these vessels in speed, and probably future development will be along the lines of the "Olympic" and Tritanio," These moderate-speed vessels are to be driven by a combination of reciprocating engines and fritanio that have not been appeared to the second that the turbine. In a recent trip to Now Zaland a merchant vessel, the "Olympic" side with engines and turbines, made the same average speed as the sister shape "Onter" and "Opeava," fitted with engines and turbines, made the same average speed as the sister shape "Opeava" and "Opeava," fitted with reciprocating engines about. Her cost consumption per cent in the water consumption, all three ships having the same bother installation. In this combination, when reversing, the turbine le cut out and the t vibration the re was, but by improving propelle having the same boiler installation. In this combina-tion, when reversing, the turbles le cut out and the reciprosaling engines are connected directly to the condenser Toward the close of the year two inter-esting devices, designed to reconcile the slow-speed demands of the propeller with the high-speed demands of the turbles, were made public. One, designed by Admiral Mevilles and Nr McAjine, consists of a re-Admiral Melville and Mr McAlpine, consists of a re-duction gear of the helical type interposed between the turbine and propeller shaft. The other, designed by a German engineer, employs a form of hydraulic turbine transmission, in which the ratio of turbine speed to propeller speed can be varied indefinitely For both devices a high efficiency rate is claimed. The For both devices a nign emiciency rate is cusined and Curtis turbine, because of its large diameter, and comparatively low speed of revolution, has less trouble from propeller inemiciency than the Parsons type The loss of the "Republic" early in the year gave dramatic evidence of the value of wireless telegraphy as a safeguard to the safety of passengers and ships. It served also to draw attention to the question of bulkserved also to draw attention to the question of Duk-head protociton. Theoretically, the "Ropublic" should have stayed afoat long enough to be brought into port it is probable that she sank because of the gradual failure of her buikheads, one by one. On the other hand, the value of buikhead protection was proved by hand, the value of builthead protection was proved by the fact that the colliding ship, the "Florida," with 30 feet of her bow crushed in, was able to make port in safety. An important event for the navigator was 35 feet of her hew crushed in, was able to make port in asfery An important event for the awigator was the launch of the magnetic survey year. "Greeke" and provided the property of the state of the magnetic material entered Rhe was built for the Carnagie Institution at Washington, and her surveys of the common state of the c An interesting novelty in hull construction was seen in the "Monitoria," whose hull is built with large cor-rugations, the object of which is to increase the longi tudinal strength of the ship, without increasing the weight. The extra cost is slight, and the carrying capacity is said to be increased from three to four

The most surprising fact in railroad development during 1909 was the continued and very considerable during 1969 was the continued and very considerable increase in the size of passenger and freight ideometries. So marked has this been, that we have ceased to hear anything of this about the 'llmits of size as he ing been surely reached." The adoption of the Mallel articulated system has made this increase possible Two locomotives built by the Baldwin Company may be quoted as instances of this construction. A freight commotive for the Komutain Division of the Scotlern locomotive for the Mountain Division of the Southern Pacific Railway, built a few months ago, has 6,333 square feet of heating surface, the engine weighs 213 tons, and, the engine and tender together weigh just under 300 tons. Toward the close of the year the same company built for the Atchien, Topeka & Banta Fé Railway a still larger loo notive, with 6,631 square feet of way a still larger locomotive, with 6,631 aquare feet of heating surface and 1,745 square feet of superheating and reheating surface, the engine alone weighs 231 tons, and the engine and tender together 350 tons. tons, and the engine and tender together 350 tons. The most howely and important departure in the new passenger engines of the year is a buge Millet 15-wheel locomotive, with two high-preserve 35-inch cyclinders driving six coupled 75-inch wheels, and two Shinch low-pressure cylinders driving four coupled 75-inch wheels, and two sixth wheels. The total needing surrhoes is 4,750 squares feet, and there are 1,111 squares refer of experiments and reflecting surrhoes. The engine weight 135 tons, and the engine and tender together 950 tons. Buth an engine will be able to haul the exceedingly heavy American express trains at a rate of speed equal to that of the lighter European trains Most encouraging their of the lighter European trains. Most encouraging has been the great improvement in the quality of steel ralfa delivered from the rail mills. Reports of the Public Service Commissions of New York State, show that whereast during the winter of 18074 threelywest £17 ceases of rail finityre spoored, during the Winter of 18095 the total number was £1250—a better show-ing, but harders room for much further improvement.

It is encouraging, also, to note a decrease in the num-ber of railway accidents. This is due in some meas-ure to the increasing application of the block signaling m, which now, except for a few short distances totaling about 100 miles, extends unbroken from the Atlantic to the Pacific coasts. Great activity is also being displayed in the development of various forms being displayed in the development of various forms of automatic alguainty, and particularly of that class of devices which acts directly on the train, and presents some visual or audible signal in the engineers cab. A device of this character for automatically and argualually applying the air brakes was recently sasted on the Eric tracks with excellent results. In spice of the deversal statement of the formation of the formation of the several statements of the practical application, the monorall system is making but alow progress. The literature of the several statements the state of the contraction of the several statements of the several statements and the several statements are sentenced to the several statements and the several statements are sentenced to the several statements the several statements are sentenced as the second statement and the second statements are sentenced as the second statements the second statements are sentenced as the second statement to the second statement and the second statements are sentenced as the second statement and statements are sentenced as the second statements are sentenced as the second statement and statements are sentenced as the second statements are sentenced as the second statement and statements are sentenced as the second statemen latest, and as far as experimental tests so the most ing, is the Brennan gyrostatic railway, which promising, is the Brennan grostatic railway, which is receiving support in Europe, notably from the officials of the British army. The little experimental car exhibited in the surping of 190° has been followed by a full-stude car, weighing 21 tons and carrying a lost of 40 passengers, which has made successful tipe on an experimental track. The present indications are that the system may find useful application on light railways, acting as feeders to the main steam or six-

### Astronomy, Photography, and Chemistry.

The year 1909 is astronomically memorable for the return of Halleys famous comet. On September 11th last, Dr Max Wolf of Heidelberg discovered this Aistoric wanderer upon one of his photographic plates in almost the exact position which the calculations of Cowell and Crommelin called for—a feat which may be regarded as a triumph of mathematical astronomy The comet will pass perihelion on April 20th, and will be a conspicuous object in the western heavens after sunset about the middle of May, at which time the earth will pass through a portion of the comet's tall, and the comet itself will cross the sun a disk The reappearance is therefore of exceptional interest because it will give astronomers an opportunity of obtaining much valuable information as to the comet's structure

The year was further signalized by the discovery of

another come by Mr Daniel of the Princeton Observa-tory—the third he now has to his credit.

On September 34th, 1969, an opposition of Mars occurred—the most favorable which astronomers can possibly have for another fifteen years. On that date the planet was distant 35,500,000 miles. Naturally the old question of Martian habitability was revived Prof Pickering, in order to settle it one proposed a method of signaling by mirrors, and Prof Wood of Johns Hopkins University suggested a method of "winking" by means of black cloths on reels Neither astronomer probably believes in in-telligent life on Mars, but was actuated solely by a desire to close a wearisome, perennial debate. The theory of habitability depends very largely upon the presence of water on Mars. Dr Campbell, director of presence of water on Mark. Dr Campbell, director of the Lick Observatory, made a careful comparison last year of the spectra of the moon and Mars. He found that there was no appreciable difference between the two, from which be infers that Mars must be pre-tically waterless and therefore as dead as the Moon. Very, of Prof Lowell's staff, on the other hand, has arrived at a directly opposite conclusion. So far-from being decided, the old question is therefore more alive than ever

ere were two eclipses of the Bun and two of the

There were two extipues of the Stud and two of the Monon. The intra evilipses were both total and co-curred on June 2rd and November 26th. The eclipses of the Stud. occurring on June 27th and December 13th, were respectively restral and partial. As might to expend to, the radiosative sleements attill continues to suggest the attention of chemistry and the students of the students scaled up some radium bromide in a bottle togeth with water, and observed the regular evolution of the service and the service of the servi er, and observed the regular evolution of the The work of Soddy for 1909 has she

### OXTOR AND RULAR RUNNY.

ar some a numer, and no Oxygen is the life-maintaining gase it is the most reful and the most abundant of all the elements as we still call them Its combination with other sub-stances—oxidation makes heat and that is why the sentient body is generally warmer than the atmosphere about it. All animal and vegetable life depends took oxygen under the sun a benignant influence the plants give out this gas which thus from the plants give out this gas which thus from the plants give out this gas which thus from the plants give out this gas which thus from the plants give out this gas which thus from the plants give the pla

the physiological sense we mean not only the series of acts known as mean not only the series or acts known as breathing lut also that in respiration oxy gen is carried from the lungs by the blood, through the minutest capillaries to the ut termost cells and the most microscopic tissuce of the body giving to it strength and warmth and life

In potat of fact lift itself in our present knowledge is fince ivable without orgress, which is much more important than food to the human scooning. Without the latter one may crist for mosths without the for-mer one must side within a few minutes (onsider also metabolism Normal metabo-lism is the port's chemical transformation of sayen fluids and food stuffs into bealthy itseuse The process is a near rest ing an ever changing one Nespiration pre-ling an ever changing one Nespiration pre-lined and the food stuffs. And is that in finitely complex ishorstory the animal host, three substances are combined in the co-In point of fact life itself in our nee these substances are combined in the con sinut manufacture of fresh cells and tissues state manufacture of tream cells and tissues to take the place of those whi h are as constantly dying and being removed by way of the lungs ( arbon dioxide and watery vapor) and the ex retory organs

We are thus able to appre late one of the most valuable dicts of the evolutionists that normal living is the right adjustment of internal relations to external relations again whatever an cunt of power an organ again whatever and that it power an organ ism expected in any shape is the correlate and equivalent of a power that was taken in from without in our physical life—as also in our psychi for that matter—we are absolutely dependent upon a wholesome en vironment for wholesome existence and by far the most essential and the most benefi-

far the most essential and the most neutro-cant element which our environment affords us is exygen it is here very important to note that nature does not you haste us this exygen jure she has tempered it for our use by combining about one part of it with about four parts of hirogen (an inert component) Oxygen pure is irritating and ozone a form of oxygen in which three atoms are considered to be condensed into two—has in experi consistence to be canonised into two-main in experi-ments been found so causilt as to produce pulmonary it flaumations. The safest and the only good and right form of oxygen inhalation for normal restures is in ombination as it exists in the stmoephere for this is the form to which during many ages the race this is the form to which during many ages use race has become adapted it is possible that in other some creatures respired oxygen under a different combina-tion than that which now obtains but in those scone there were no human beings—only such creatures as ichthyosauri and the dodo No we can live most advantageously most wholes mely and with the best

human results only in conformity with natural laws as we find them, and with due restect and remard to

There are however abnormal states of the human body in which oxygenation is deficient by reason of disease processes and in these diseases it is sought to administer oxygen in greater proportion than obtains in the ordinary atmos phere We give it thus when oxy phere We give it thus when oxy g nation of the blood is interfered with as in dyspaces em; hysems asthna croup whooping cough as-phyxis tuberculosis and pneumoand when the oxyge tion in the blood is poor as in ane min diabetes and chlorosis (the ings are I b lieve a sthoritative In such diseases as those just men tioned says n mir d with a deter-minal quantity of air energizes to a considerable legree the nutritive slightly elevates the temperature stimulates the cardiac movements and augments the bodily weight the number of red blood cells is in creased and their organic activity is stimulated although this setion

ts not constant, the effects suby become so greater nutritive changes that are thus promo Observe now the portion of Hayems statemen I have italicised. In point of fact even in dis ent which I have italicised. In point of fact even in disease we do not as we could not, administer crypten pure, moreour the nurse in administering holds the tube in sand manner between the parted lips that some admirture of air takes places this admirature is essential if the corporate is to be respired at all. Nor have I, her my



Apparatus for registering work performed after inhaling oxygen. OXYGEN AND HUMAN ENERGY

part been always sure of the efficacy of oxygen in such diseases as pneumonia. I have felt that pure at mospheri air—the colder the better its tonic proper mospheri air—the coluer the better its owns properties—has been as efficacious as extrem in cases as a fresh some physicians indeed go so far as to declare that the appearance of the extreme that counters the beginning of the end for the unfortunate patient.

the beginning of the end for the unfortunate Nor does the oxygen tank supplied for us sick room contain pure oxygen. One of the firms which supplies this gas for the sick room informs me that their purest oxygen is 90 per cent the remainder being nitrogen that in half the cases physicians pr for and call for tanks containing oxygen compound which is made up of 66 per cent oxygen 30 per cen nitrous oxide (laughing gas) and 10 per cent nitrogen

I find it now very apropos to present certain physic-(Concluded on page 16)



or an across equivieur. When types wise present by which the beity embarrors to ested threading interprises the idea was reguested to effect artificiality a local in crease in the imparitum of those parts of the beity which are effected by disease, then applicing the human.

In the tomogrithmy of these peaks of the before an address by dismon, time assigning the human at in first advanced to the control of the process in artificial hand mappy is obtained by the finalizer methods of treatment which here been fix use from time femmesorial. Herever, there was so day as populatility of really permenting the body with best, any offered being merry representance that have been fix use the best permenting the body with best, any offered being merry representant resulting of the whole body, the many the best permenting the properties and fixation of hest timings evaporation, and fixation of hest timings evaporation.

The process described in the following paragraphs allows any part of the body ten by

The process described in the following programping allows any part of the body to be heated to any temperature destined, precing locally faver temperature of any 100 degrees to 104 degrees P is order than to increase blood circulation and necessary which are instrumental in deducting the discussor The local heating in selected by making or the contract of the cont

duce an appreciable heating effect by the application of electricity would further have application of sectricity would further have been frustrated by the small amount of se-ergy supplied to the humban body in the form of ordinary curvents white any restly important increase would have resulted in a vicient stimulus of the nervous system and the electrolytical destruction of tissues intensities of 50 to 100 milliampersa thus constituted the extense. Buth, each buth ones. intensities of 80 to 100 milliamperes thus constituted the extreme limit even in the case of small current dessities whereas twenty to 6fty times as much current would have been required for the production of an adequate heating effect. High frequency currents as lately used in connection with wireless takegraphy asterd a means of applying entheous amounts of current energy to the body without any risk.

our rest seegy to the only without any raz of injury. In fact these currents perform wibrations of such rapidity as to axceed the limits of excitability of our nerrous sys-tic. The alternations in current direction also ex-clude any electrolytical effect

the state of the control of the cont

assa of highly sensitive apparatus.

A Berlin firm has recently constructed an outst for generating
high frequency vibrations thus
making heat ponetration accessible
to medicine as a new therapeutic
method

The most important part of the outilt, vis the apparatus used to guarante the vibrations, consists of two autstantial copper electrodes separated by a small distance beseparated by a small distance tween which the electrical charges pass in an inclosed partment. These discharges produced by the high tension of



AN APPARATUR FOR PROPERTY COME WANT PROPERTY.

is soon assepanced by a refux, which in its speak the normal condition, and so on Hance contact in the vibratory circuit are comparable which is soon a cocates in the vibration

being applied directly, the vib so no oven being asplied directly, the vibrations generated by the condenser circuit are at thir sub-densities to a convenient tension, which is grade and by shuntings from the secondary coil. The correct is supplied by means of conductors to the elec-trode pitants to be applied to the body after first passing through an amounter

body that that passing through manader.

This thermo-posteration outli-can be operated by direct con-notion with an alternating-cur-rect circuit, the tension being rated rivers, the tension being rated by a transformer before sortering the generator When continuous current substitution of the con-tension of the continuous current substitution of the current substitution of the continuous current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the current substitution of the substitution of the current substitution of the

### AN AUTOMATIO APPARATOR FOR JECTING PICTURES BY ALCOUSE BOYER

art August servat.

Radigust and Ramolt of Paris
have patented as automatic projecting lanters, which they sail
the "Chross" It constitute of an shorter lanters provided
the district lanters of an
electric lanters provided
the control of the control of the
entity between the condensing
and projecting lanses by a four
ble system of hosts Duritag they
movement of the silber, the lanter
to the silber, the lanter of the
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enti

is automatically out off by a shutter, so that the image does not appear on the screen until it has become moticeless

ticeless
The lamps are self-regulating and designed for ten
sions of 7, 15, and 30 voits. The position of the are
is rigorously fixed and the carbons are inclined producing the maximum illumination. The focal length
of the condensers is about 5 inches. The projecting

Geolog the maximum Humbation The income of the condensers is about it inches The i less can be toressed by a rack and plates, and covers a scerem 3 yards expense in the distance of the condense of the conde tisements painted on the curtain, in rail way stations it may be am loyed to show the somery along the line, and in news-paper offices it will prove more useful and effective than written bulletins or project ing lanterns of the ordinary type

THE SCIENTIFIC AREAION TROPEY
THE SCIENTIFIC AREAION TROPEY
THE SCIENTIFIC AREAION TROPEY
The year 1969 has closed with only at size trial for the Scientific Assessment by lag Machine Trophy and Assessment by lag Machine Trophy and the present time Mr Glonn Curties to his result, is the only American value for his result, is the only American value for head considerable expanse for the purpose of concerning the development of an activity has been been also been also been also as a considerable expanse for the purpose of exception of the purpose of the

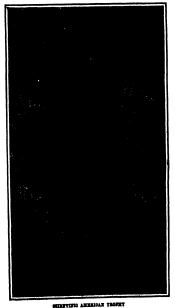
holiopoters and besting-wing machines, would receive encouragement. The conditions required at first were a straightnway flight of one kilometer (0 611 mile) a straightaway mgat or one amounter (0 531 miles) in a straight line. On July 4th, 1908, lif (9 6mn Ourties carried off the Trophy by covering somewhat more than a mile in the "June Buy. I nive or the slights which were then being made by French aviators the conditions were changed for 1909 to 28 kilometers (15% miles) in a closed circuit, in other words 5



AN AUTOMATIC APPARATUS FOR PROJECTING PICTURES.

N.

kilometers (8.1 miles) more than required in the Inter-national Contest for the Bennett Trophy Under the 1000 rules the winner for any year is the aviator who makes the longest and best flight in a closed circuit during that year In 1000 Mr Curtias was the only makes the ongest and near man in a smeat circuit during that year. In 1909 Mr Curitias was the only competitor who came forward. He easily complied with the conditions and sacordingry he must be regarded as the winner of the Trophy for the year 1909.



Wate he mad need her by Claim II. Curties.

His achievement is remarkable, because he flew double the distance required in the Bennett (up Race The lack of entries for competition during 1909 was certainly not due to formidable conditions as the certainly not due to forminance conditions as one Aero (lute, in establishing the rules for the year of deavoned to make them so easy that any asplring or perimenter would feel that the Trophy would be well within his reach. The discouraging fast manine that during the past year in spite of the notable a hiere ments of Curlies and the

in spite of the notable a hiere ments of Curies and the Wrights very few new men have come into the field Re-ports reach this office from various parts of the country that machines are being built but successful flights are few and but successful nights are reward far between In France during the past year the science of avi ation has advanced by leaps and bounds as was witnessed by the successful flights at Rhelms and Juvisy and by the almost daily reports of successful trials of reports of successful trials of new machines or long cross country flights by well known aviators There are fortunately a number of men in various parts of the country who are making serious experiments and it is to be hoped that great strides will be made during the year 1910 and that the competi-tion for the Trophy will bring into the field a large number of

Possibly the present lack of progress is due to the fact that in America at least the aero plane is not as vet what may be called a ommercial

product It was not until the automobile had become a serious competitor of the horse drawn whicle that the Bennett and Vanderbilt cups and other automobile tacing trophies were samestly comp ted for Perhaps the history of seronault sport may be the same and that when seroplants are manufactured wholesal the flying machine will hold a recognized position in the sport of the country in France we believe there are no less than a dozen

establishments actively engaged in the making and selling of aeroplanes. This placing ing and selling of aeroplanes. This placing of the firing makine upon a commercial footing undoubtedly has played its part in populariring the monoplane and the biplane among Frenchmen. For all that however there must have been popular cuttusiams before the industry could have been started—an incentive which was not that of making money. We hope that in 1910 Mr. Cutties will asset his accommendation than the commendation of the second selection. tiss will again be a competitor that he will self against men who are worthy of his steel and that a contest will be inaugu rated which will arouse in this country something like the enthusiasm which was evinced at Rheims

ditions which will go tasts for the cup in 1910 will be announced later They will be so drawn as to keep pace with the progress made last year

A table prepared for the Archiv für Eisen states that at the commen ment of 1908 the total railway mileage of the whole world was 594 842 miles divided the whole world was 54 542 mires divided as follows America 302 928 Europe 199
346 Asia 56 284 Africa 18 518 and Austra
lia 17 786 The cost of construction per mile has been highest in Great Britain and Iroland where it averaged \$271 000 per mile Iroland where it averaged \$271 000 per miles in Belgium the cost was \$172 900 France \$122 000 Germany \$108 500 Italy \$12 000 Russia \$479 600 per mile in the United States the average cost has been \$48 800 in New Zealand \$486 300 and in Queensland Australia it is as low as 884 200

The boring conducted by the Prussian Department of Mines at Cruchow in Silesia had to be discontinued revently upon reaching a duph of .-40 melers in view of the fast that the cost of drilling at this depth is hard sandstone was out of preportion to the obtainable results Like the boring at Parus howing in Silesia which had to be Paruschowitz in Silenia which had to be abandoned at a depth of 2003 meters on ac count of the drills breaking the Czuchow boring was undertaken for scientific pur posses only since mining operations are of tourse entirely impossible at this depth, even if no account is taken of the rapidity with which the expense for hoisting in-

### REPROSPROT OF THE YEAR 1900.

Extraorant of Tail rate level.

(Occided from page 5.)

without question that helium is produced from uranium as well as from redium, the amount being two milligrammes of belium annually from over a milion kilogrammes of uranium.

In photography we find an interesting attempt to

present moving pictures in colors by several inventors

—Barricelli, Friese-Greene, and Urban and Smith.

Curiously enough, all three inventions are based upon Curiously enough, all three inventions are based upon the same principle of so rapidly preeming images colored red, yellow, and blue that the eye has no time to notice the successive presentations, and therefore combines them into one picture. In the same field of chronophotography must be mentioned the im-portant application of the moving pictures machine to the ultra microscope by Dr. Comandon, an application the utra sucroscope by Dr. Comanson, an application somewhat similar in principle to the combination of the ordinary microscope and kinetoscope made by Dr. Robert K Walkins of this city over tan years ago Comandon's invention promises to be of considerable educational value in actually enabling us to see the struggless of our blood corpuscies with their microbic

In view of the great salvance in its efficiency, the tungsten lamp is settlind to be considered the most metable improvement of the year in the field of electricity. Mention should be made, however of the important private in the plant. In Norway for reducing integen from the air, which is being as successfully open each that its product is being soil in successful on petition with the supply from Chill. Also the calcium of the contraction of the position with the supply from Chill Also the calcular quantiles fortilizer process, bilithert is the seigner-mostial stage, has, during the year, been demonstrated to be commercially practicable. The Beltin takephoto-graphic process has been further improved, and in religious desirations of the process of transmission is based upon the fact that a photo-graphic plate in bichromatical goalint presents a nor-ories of the process of transmission of the process of transmission is based upon the fact that a photo-graphic plate in bichromatical goalint presents a nor-ories of the process of the process of the pro-cess of the process of the process of the pro-tain process of the process of the process of the taken for producing, by a tracing polit, ordinal movements, and fluctualities in the transmission cur-tain process. The process of the process of the pro-tes at abstract a used to good our battleights during the phony as used upon our battleships during the world cruise, and a number of sintions have been put in operation on the Great Lakes for communication with steamships. Communication has been established over the ninety miles separating Chicago from Mil waukee, and steamers have been in touch with the watter, and sisteners have been in rock with the
shore from a fluance of forty five miles Gabe in
shore from a fluance of forty five miles Gabe in
the schleved sense anceves in the steering of a
fluor, torpedo by the wireless method privately
teared by Tesia in this country and Armstrong in Sanland The torpedo is driven by an internal-contentrained in a comparisonst containing the wirelessatrailed instruments it is claimed that the control as
feetive up to five or six miles. In recent tests its
motion was started and stopped at will and the rudder
as successfully operated from a small book at at a demotor was started and stopped at will and the round was successfully operated from a small boat at a distance of a little over 100 yards. Mention should also be made of experimental wireless communications with a balloon, made by the United States Army Signal Corps by means of a 100-foot phosphor-brones wire suspended below a balloon 1,000 freet in the air Communications. munication was kept up from the Washington station until the balloon was about six miles distant, and messages were received from Annapolis over distances messages were received trom of from twenty to ten miles

The application of electric traction to steam rail-The application of electric traction to steam rati-reads continues to show gratifying results. Although no figures have been made public as to its economy, the electrical operation of the suburban tracks and termi-nals of the New York Castral and New Haven lines make of the New York Contral and New Haven lines has been carried on throughout the year with unbrahen success. The New York Central electric sons to long extended to White Paina, and the New Haven Company are building a mile of experimental overshead line beyond fituanford, preparatory to the extension of the system to New Haven. The latter company have also ordered two experimental relight becomotives, and it is the intention to operate the whole time from New York to New Haven, a distinct of manyly eighty military and the state of the contral time of the motor front to and and placing it shows the the motor from the axie and placing it above the frame, with a view to raising the center of gravity and g the stresses on the track and roads tion should be made here of a most important enlarg ment of the capacity of central power stations by the introduction of low-pressure turbines between the lowpressure cylinders and the condensers, in such power stations as are now operated by reciprocating engines. In the 59th Birset power sistion of the New York subways the maximum output of 8 000 kilowatts of the

16,000 kilowatta by interposing a Curtis turbine in

Groat as was the advance made in aeronautics dur-ing 1908, it was far surpassed by the extraordinary developments of the past year, and when the history of this new art comes to be written, the sensational performances at the Rheims meet, and subsequently, will be referred to as marking the era of practical and thoroughly controlled human flight with the heavier than-air machine. On July 30th, Orville Wright completed the government tests at Fort Myre by flying for ton miles across country at an average speed of 4285 miles per hour with a passenger about, having previously made a flight with a passenger record, having previously made a flight with a passenger over a minute. The miles of the property of the control of the minute price of \$80,000 What has probably the most popular performance that probably the most popular performance of the year control of 1417 fifth, when Bierlet made he monosaful 11-miles fight across the Biglish Channel. At the great Rheims meet, which opened on Armel 220nd, no less than 38 seroplases were entered, of which 18 made successful flight, there being about an equal number of biplanes and memoplanes represented. Here the public witnessed the astenishing sight of as many as half a down seroplanes in the air at one time, pleted the government tests at Fort Myer by flying Here the public witnessed the autonishing sight of as many as half a dosen seroplanes in the air at one time, the pilots of which showed perfect control of their ma-chines in the gusty winds that prevailed Both Bleriot and Curties proved how near the aeroplane had come to reaching the 50-mile-an-hour mark, the former winning the 621-mile race at a speed of 47.78 miles hour, and Curtiss bringing home to America the In hour, and Curliss bringing home to America the in national Cup by covering 1243 miles at a spet 4704 miles per hour. That the seroplane poss-endurance as well as speed was proved by Far who won the long-distance race with a record of 1 who won the long-distance race with a record of 111.88 miles covered in 3 hours, 4 minutes 552/5 seconds. Bubsequently to the meet, Farman, on November 3rd, at Mourmelon, France, made a bold bid for the Michelin Prise, held by the Wright brothers, by covering 144 miles in 4 hours, 17 minutes, and 53 seconds, and since, at the present writing, there is no indication that the Wrights will make an effort to retain the cup, it must perfore be returned to France During the It must perform be returned to France. During the Indono Fulson Colebration in New York, William Unique Delication in New York, William Unique Judicia in New York, William William India in the reliability of his machina by fright from Governor's lained up the Hussen River to Grant's Tomb and back again. Barly in October Orrillo Wright in an enhaltion at Footdam Cormany, rose to the unprecedented height of over 1,800 for a few Hussen River in the Commany, rose to the unprecedented height of over 1,800 for a few Hussen River in the Commany of from Juvissy to Paris and back, a distance of 30 miles, during which he flew above the Elifel Tower An en-couraging fact, pointing to the more complete mastery of flight, is the increased assurance with which ariators are now making their flights under unfavoral ators are now making their flights under unavorance weather conditions instances of this occurred both at the Rheims and at the Blackpool meets, when Latham passed successfully through heavy thunder squalls and also drove his machine around a closed ruit in the face of a wind which was heavy enough at times to bring him almost to a standstill altogether, it must be admitted that the honor altogether, it must be admitted that the honors of the year are about equally drieded between the monoplane and the hipkans. Puture developments will be in the direction of improved devices for starting and alighting, and the monitor stability. A most encouraging reaching the monitor stability. A most encouraging fearer is the present orduction which had been made in the weight of the seroplane, Certifer's machine which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. Which is credited with a speed of over 50 molecules. The state of the st ing more than the necessary low mines in a cuse-circuit, won the Scherriere American trophy for the second time, his first success being scored in 1908. It is a strange anomaly that there should have been but a single competitor in the country which gave birth to constul sero

In its own field the dirigible has made preportional preparable the inspect and its endurance. Count Zepolius with his powerful dirigible "Expella IIII" is fastlend of all competitors; and his journey from Pieririchabaden to Berlin and back, a total distance of zero mine, was a fine performance, and reddends to the everlasting oraclit of the velocial investor. Other form the contraction of the country of the In its own field the dirigible has made proportion

wame ton green current so me tons at men.

The automobile has bisched such a chape of periods that the record of improvement is confined as-tirely to mattern at detail—as striking nevel for have been developed during the year. The high-powered car is now both almost excitatively for problem proposed.

For tearing, a limit of 60 to 10 horsepowers to figure to meet the regularization of the winning purchases as the regularization of the winning purchases, and the second purchases, and it is now possible to prosent a 4-cytinder machine embodying all the orwested features of long wheel basis (light weight, and generally ment appearance, to prices varying from 1780 to \$1,000. The long-distance meets have wanted in popularity, and such voting as is now done in confined largely to contacts between stories are not incleased largely to contacts between stories are not incleased largely to contacts between stories are not incleased largely to contact between stories are not contact in the popularity, and such voting as is now done in confined largely to contact between the new section of the property of the contact of the property of the pro become for position in public favor Mention abould be made of a very creditable experiment made by Mr. H. L. Aldrich of International Marine Engineering. be made of a very creations experiment mass of all. It. Aldrich of international Marko Budivestillar, who complete of the restriction of the control of the

### Flying-Reci

Deputy Consul-General Simon W Hanauer reports from Frankfort that a limited stock company has been formed in Berlin by leading German industrial concerns for the purpose of manufacturing flying ma

chines of the Wright system.

Wilbur and Orville Wright have given the new
company, whose firm name is Fingmaschine Wright,
G. m. b. H., the right to work all their patents,
models, etc., for making aeroplanes in Germany. The mpany has a working capital of 500,000 marks new company has a working capital of 60,000 marks (18118400), its principals participants are Krupp (Company, of Ement; A. Borsig Machine and Locomotire Works, Hugo Sidnes, coal and iron operator, Delbrusck, Leo & Co., bankers, Ludwig Lowes & Co., machine, area, and tool manufactures; Aerial Vehicle Company, Motor Air Locomotion Experimental Company, the General Electric Company, of Berlin, the Riscirc Obenical Company, of Ritterfid. Can't and Kehler will be the managing director of the new company.

### The Aviation Beeting at Les Aug

The Aviation Beccing at Les Augeles.

Angeles, Cal. From January 10th 58th inclusive. Announcement has been marked to the State Angeles, Cal. From January 10th 58th inclusive. Announcement has been marked to the state of the s

by heavest-install magnitude.

The Automobile Shows in New York,
On New Year's ore the American Motor Car Manusflectured American will open its annual automobile
show at the Gread Covirol Paison in New York city.
This show of the "millocened" manufacturers will last
a week. There are \$18 enthitions, and the total vable
of the exhibits in in he sulphorhood of \$1,100,000.
Nearly 100 enthitions of pairs and marketies are more
numerous than ever before.
The Licensed American Carlo Automobile Manufacturer
or the state of the sulphorhood of the sulphorhood
particular and the sulphorhood of the sulphorhood of \$1,000,000.
Nearly 100 enthitions of pairs and marketies are more
numerous than ever before.
The Licensed American Carlo Automobile Manufacturer
or the sulphorhood of the Carlo Car

The gyrotatic valves, on feveried by Richard School, a Retinant subject to the set improvement of School nary one, is now to this construction of the set of the set

After Marking how to fly a Curtiss biplane and maker personal excellent flights at Hammondsport, N. Y al excellent flights at Hammondsport, N. Y., at of which lasted 25 minutes. Charles K. the longest of which lasted 25 minutes, Charles K. Einglifton made some daring flights at St. Joseph, Mo, recently, as detailed below by our correspondent. The insolubse he is using is the same one that Mr Curties used at Governor's Island, New York, when he atused at Governors limind, New York, when he at-tempted to fit there during the Hodson-Pulton celebra-tion. It is fitted with a 25-horse-power 4-cylinder water-cooled motor, and the planes have a 30-foot spread. The machine weighe some 560 pounds, The first flight at 8t. Joseph was made on Sunday,

mber 12th, over a circular course above the from December 18th, over a circular course shows the frozon surface of Lake Contrary. After two straightaway slights of a half kilometer against the wind and a kilometer with the wind. In order to test the motor, the highane assended in a snow storm so intense as to be hinding to the spectators. The velocity of the wind stored and the stored of the first contract of 40 reet was maintained inrougnout the one and a half times around the course—five miles—except when nearing the Casino, a summer opera house that juts out into the lake. This forms the "seroplane grave-yard" of the course. On Tuesday, December 14th, a trial in the field inside the race track was made. The wind was blowing a gale of 30 miles an hour estimat velocity A start was made over ice, snow, and weeds of the infield. The machine got off the ground under these adverse conditions, but made a 100-foot flight only. A new carbureter had been put on the engine and a 4-bladed propeller substituted for the 2-bladed one. A bad spark plug gave trouble throughout the day. Later the machine was wheeled to the lake, and a start made from the los. The aviator feared the a start made from the ice. The aviator feared the demolishment of the machine, and held close to the surface A piercing northwest wind swept the ice, and during the two flights a speed of 63 miles per hour was made with the wind while flying near the west shore. The timing was done by Mr. J. H. Heas, and the distance was measured by your corre-

spondent. Wednesday was a day of failure, owing to motor trubble and unfavorable winds, until a late hour in the affaracon, when two trials were made over the fail within the race track. The first was a very short flight, and the second resulted in breaking two support brices of the borisontal rudder. The manager of the light support brices of the borisontal rudder. ciation insisted that the starts be made from the field within the race track. This was an undulating sur-face covered with ice and snow, and only 1,250 feet

long.
On Thursday, after the 3-bladed propeller had been replaced and the old carbureter refusalized, the machine was taken to the take once more A stiff north west gate delayed flight until late in the atternoor would be the stiff of the course was accomplished with made. A circuit of the course was accomplished with made to the course with the course was accomplished with the course of the course was accorded to the course of the course which was a course of the and the machine was stopped so suddenly by the ap plication of the brake that it skidded completely around on the ice This resulted in breaking the co-ment of the tires and almost ripping them off Later, when the second flight began, after covering 600 feet motor started missing, and while passing through drift two tires were thrown, locking one who through but notwithstanding this, the machine again rose and covered 1,000 feet. The motor picked up in the mean-time. Altogether, some remarkable feats were accom-

The fight on Sunday, December 18th, was discon-tinued owing to inability to see, the fast-tailing snow having formed ion upon the aviator's goggies. This flight was made in private, and was not winessed by

flight was masses ... many people On Sunday, December 19th, aviator Hamilton made his longest and best flight at St. Joseph. He circled above Lake Contrary for twelve minutes. The flight was witnessed by 600 interested spectators

TO Your Papers: They'are of Perman

Preserve Year Papers; Thou'see of Permanent Valles, By laking a little trouble, when a paper first conses to hand, it may be preserved to form a permanent and valuable addition to the reading matter with which everyone should be supplied. We furnish a near and attractive oth board bindow, which will be sent by mail, prepaid, for \$1.50. It has good strong covers, of which the same Eugerstrom Assentar or Strumstrow on which the same SCENTER ANXIOLAY OF SCENTRO ASSEMAN EVENTAGES IN SAME OF 1997. THE SECONDARY ASSEMAN EVENTAGES IN SAME OF 1997. THE SECONDARY IN COLUMB DOOL. DOES NIMED MAY THEN BY MADE AN IN-clude BOOK. DOES NIMED MAY THEN BY MADE AND ANXIONAL UNIQUE AND ANXIONAL SAME OF THE SECONDARY OF THE SECONDARY MADE AND ANXIONAL SAME OF THE SECONDARY OF THE SECONDARY MADE AND ANXIONAL SAME OF THE SECONDARY OF THE SEC

### Scientific American

### Correspondence.

## To the Edite

O the Editor of the SCHETTIFIC AMERICAN

Following closely on the heels of the article in the Following closely on the heels of the article in the CERTITIPA MERICAL STRING THE NEW Y. B. SELISHED, "North Dakota" the proof title of "Fastest Dread-nought Aflast", there appears in the columns of a Canadian publication of the first class a statement to the effect that Parithal "Dreadoughts" are known to make an average of over 28 knots an hour while the maximum average made by the "North Dakota" is below 22 knots an hour If the exact fayrure relating to Great Britain's naval

affairs are not very generally known, may it not be that she, perhaps more wisely, prefers not to publish to the world her naval secrets, while Americans, in justifiable pride over their achievements, are making ill-advised haste to claim the first place in the prog-ress of naval science. We have a right to expect the perfection of accuracy in all matters treated of in the pages of the Scientific American M W

Stanstead, Queb [The "Dreadnoughts" referred to as making over 23 knots are probably the cruiser-Dreadnoughts of the "Invincible" type The "North Dakots" is of another

OF BARTE'S ROTATION ON STRONGOPIC CARS. To the Editor of the SCIENTIFIC AMERICAN

I take much pleasure in reading your paper, and be It uses much piesures in reasong your paper, and or-ing a railroad man, was especially interested in the article describing the monorali car I have seen the groscope principle, for balancing such a car, dis-cussed numerous times, but there is one point regard ing gyroscopes which I have never seen mentioned in connection with this achieva.

connection with this scheme.

It may not be of much importance, but it is nevertheless interesting, to note that a gyroscope does not retain its balance relative to the earth, but relative to a fixed point in space In other words, it would appear that on a "mono-railroad" running north and th a car would be tilted to the west at the rate of fifteen degrees per hour, or one degree every four minutes, due to the rotation of the earth Of course, this is not fast enough to inconvenience

anything, and perhaps Mr Brennan has provided a way to overcome this difficulty, but if not, it would be interesting to hear what others have to say in

At any rate, a solution of this problem would be more interesting and of more practical benefit than the computation of our ancestors For the monorali appears like a great improvement over the double-rail system for economical and rapid transportation In fact, for light, high-speed passenger and express traf-fic, it would seem as if there is a great future in store for the monorali. T E BAKER.

## Lockwood, Ohio.

### AFRIT IN MINES. To the Editor of the SCIENTIFIC AMERICAN

I noticed in a recent feate of your valuable journal a suggestion for the better safeguarding of the lives of coal miners. As this suggestion was on the line of ideas that I have for some time entertained, I would

like to amend your suggestion by an addition

I believe that stations of refuge, provided with fire
and gas-proof doors, should be established in various and gas-proof doors, anould be established in various places in coal mines, and that these stations be pre-vided with two tubes or casings driven from the su-faces by well-driving machinery. This would allow a sir, food, and water supply to be maintained indef arr, root, and water supply to be maintained indefi-nitely, whether or not it ahould be uccessary to seal the mins for the purpose of extinguishing fires. Of course, it would be necessary to equip each of these stations with telephone and possibly lighting facili-ties, and of course, with facilities for forcing air into

of the pipes ing, without having made figures on

I am assuming, without having made figures on the proposition, that sufficient air to supply a considerable number of mes could be forced through a six-loch table by sufficient pressure.

I believe it should be compulsory that mine operars about porvide some stations which would prevent such appalling calamities as the recent one at Cherry, III, and with this or some similar plan the cost would be so slight that it would be practicable to carry the same into effort. Syracuse, N. Y.

## RESPONDE SEATTS FOR MINES.

TO the Billior of the SCHETTION SKIERS.

To the Billior of the SCHETTION AGENCIAN
As a further safety precaution in the operation of
mines, I vesdie assignet the drilling of large holes, as
many as may be accessary, from the surface to the
main arteries of the workings, up through which, in
cases of dissater such as the recent one at Cherry, III,
men could be farm to safety. Seventeen-inch or
are now quite common in the oil country, and larger
cases could, be delited if necessary. These boles could

be located at different advantageous points, and terminate in rooms in the mines or alcoves cut at the sides of entries in such a location as to not interfere with their daily use Slings made of chains four chains, 30 feet long, spaced equally around a circle the size of the hole, and attached to an iron ring or spider at their upper ends, five small circular plat-forms of strong wire mesh, spaced six feet apart, in side these chains, would make what could be termed a five-storied elevator cage that would haul five m

a Breedroid elevator cage that would haul fav men or len hows up at a trip.

Such a cage could be galvanized for durability, Such a cage could be galvanized for lounds. There could be handholds placed under each platform for the men to grasp to steady Chemselves. These cages would collapse when they would arifte the bottom and could be quickly louded, a man stepping on the cages would be considered to the cage to the to each platform as it would be slowly raised, and sded, could be quickly hoisted to the surface A perhaps better cage could be made of strong wire mesh, platforms and all but would have to be made to descend into a sump drilled deeper jhan the bot-tom of the mine, so that it could be loaded as it was

The holsting frum on the surface could be operated by steam, air, scientice, or seen home power free hater would have been invaluable at Cherry. Ill., as there would have been ample time for seven a slow-operating apparatus to have saved all able to get to it, but an electrically-frien soluter would be prefetable to any other Wires from the power house could be run to each hoister, and proper laspection would insure the apparatus to be in working order, if it should be needed. The holsting drum on the surface could be operated should be needed

Air could be blown down these holes for the supply of the men at the bottom, even if the cages were being used, the wire mesh construction of them allowing its passage. Water, food, oil for light, etc., could be sent down through the holes, and even doctors with medi-

The holes could be left open at all times for venti-lation, but if such would interfere with the working of the fan currents and other ventilation systems of of the size trains and other ventration systems mines, the holes could be kept closed at the top by a proper batten If water from the salls would drip down and interfere with the working of mines, the holes could be plugged at the bottom by means of an oll well packer or similar device which, while porfectly water tight, can be quickly removed, leaving the hole clear

I can see no reason why this plan of rescue in ca of mine disasters would not be entirely practicable and effective, even in mines of one thousand or more feet in depth.

### The Current Supplement,

An illustrated description of the large double-deck An illustrated description of the large double-description by the bearing with has been constructed over the River Wear to accommodate both railroad and highroad traffic is published in the current Surpusaver, No. 1716 "A Log Box and How to Make it" is the title of an article which will undoubtedly be read with interest by amateur mechanics. Up to a few years are water noware ware seattle buself for a son. Now. ago water powers were easily bought for a song Now adays they have so definite a value that the matter of ascertaining their actual horse-power is of considerof sacertaining their actual horse-power in of considerable importance Mr W T Hyan explains how the calculation is made Robert M Strong's excellent comparison of gancine and actools engines in continued. The comet families of Saturn Uranus and Neptune are discussed by H C Wilson. L H Backeland describes the use of his newly invented substance basis for the continued and control purposes. The kinetic scope has entered a new field it now above as mortriag pictures of a world which is fortishle to the naked with the control of the current Source, and the which is explained in the current Source, account of the current Source, and the sential control of the current Source, and the Settlement of the current Source, and the Settlement of the Sett Scott writes on microscopic tree funct. The efficiency of modern aeroplanes is discussed by G Garnier on the basis of the results obtained at Rheims

### A Correction

In an article on page 462 of the Scientific American
T December 18th, 1909 it is stated that by the interposition of a turbine between the low-pressure cylinders and the condenser of the cross-compound recipi cating engines in the 59th Street power station an ad-ditional 8,000 horse-power was secured. The item should have read an additional 8,000 kilowatts. The mouto have read an additional 8,000 kilowatta. The maximum economical output of these engines is now 8,000 kilowata developed in the reciprocating element and an additional 8,000 kilowatts in the turbus mak-ing steal of 1,000 kilowatts or say about 22,000 horse-power for the whole engine

The Municipal Art Commission of New York has just published a catalogue of the works of art belonging to the city of New York It is a book of 240 pages, and contains more than 100 illustrations reproducing the works of art scattered around the city

## THE ORSAL OF BERNARD ECCIONS.

91 Bernard Hospice stands some \$120 feet abo e the level of the sea on a mor atain pass which forms one of the principal highways between Switzer

torins the of the principal nagaway.

Laid and Itally Over 20 000 per

sons cross this road every year

at das nearly two thirls of this

nunter a complish the journey in

wirter the monks and dogs of the

I spice whose mission it is to add these traviers may be said to be sponsible for many lives every

Ih hosii an lain to b one fil oldest institut us it I utope it was fund das far lak as 962 by Binard de Menthon for the lenefit of plignims journeying to Rome For many years after it was first erected it was subjected to fre quent attacks by lands of mountain robbers Often the brav monks were for ed to barriead themselves in their stronghold will stress of cather drove the I siegers away Once the host I was testroyed by fire Hr Natol on was re eived when h took its aimy over the Alps ir to Italy in the spring of 180) His force numbered 30 000 men and for miles th y lad lit rally t fight it i way f ot ly foot up the steep : Itali pass often walst deel tu si w \aloleon conv rt. I the h si e into barra ks th great guest room wir travel is are now si eltered into a bug hospital

ward
When first s. on the monantery
from an an hite toral point of view
is disag infinity. It consists of a
plain blo k of gray buildings with
massive walls till to reduce the
wind and the weight of snow no
indiviniter the nerve around the buildings is seven to

midwinter the snow around the buildings is seron to ten fert deep and sometimes forms drifts against the edificit that rea h right up to the roof. If the exterior is disappointing the same cannot be said of the in-terior On the side reserved for it is better class of travelers there is a spa lous dising room containing a handsome plane | res und to the monks by Aling Zeward while the bedrooms with their striless cur-Edward while the befrooms with their sycliess cut aliand beds are it sesses of comfort Anyone cross ing the pass is at justice liberty to enter the bospite and accept its hospitality. No exvelor is ever turned away. Two good meals are served every day namely at 19 noon and at 6 1 M. At these meals nyruentatives of almost every nation on earth may be sent aliana naturally predominate. Next come Swiss then Russians Germans Fixed Turks Spanked the Russians Germans Fixed. Turks Spanked Russians then Russians Germans Fitchi Turks Spaniard Figilish and prinqs are not rore American taveless. The food is plain but good and plutful and the bewrangs served is the famous red wine of Pitch most. After meals trax 1 rs spend their time much as they whis in easy conversation with one another in games in reading this books in the library or in inspecting the curies in the museum



The interior of the changl.

Not so long ago the hospice was put into telephonic communication with the outside world with the re-sult that the work of the monks has been lighteneds and that the number of lives lost has been reduced to mastery is connected by telepi

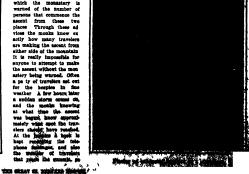


Leoking for bodies in the snew after an avalanche.



St. Bernard dog with flagon of wine

with a small inn on the Swiss side and with St Remy on the Italian side At both these station rangements are made by which the monastery is warned of the number of s that commence the from these two places Through these ad vices the monks know ex actly how many travelers are making the ascent from either side of the mon It is really impo anyone to attempt to make the ascent without the mon astery being warped. Often



that at any given moment the applie has number of people on the pass and their

Only a few

works Aip a theirage was received ex-titat three men, two women, and on-child had deared up the path. The weather area unsettled at the time, and two hours haten a bilading smowthern cause of Ai once two of the britishes accompanied by two dops hastened down the pass to look for the twisters and guide to look for the travelers and them to the hospice. They about where the travelers be and were surprised the dogs failed to seent them. the dogs falled to scent them. After nearly two hours of retilies search a dog arrived from the mea-netery He curried a message the effect that after they had left, a talephene message had been re-outwed asying that the travelers and returned to the ins the half returned to the instance of the M Boornools the present prevent and he principal sastiant Pro-luce Darbellay to whom I am is debted for the information con-tained in this article sessure the that the wonderful stories that After

that the wonderful stories that have been told about the sagacity of the dogs are not exaggrented. Near the hospice is a monument to Barry This dog saved forty lives in a period of ten years and then was accidentally killed

In the Rennels at the hospice there are at the present time fif teen trained dogs and an equal number of bitches and young puppies They were all born at the monastery Their training is very simple During the summer months. months when the monks are not so busy they take the young dogs

out in the valleys or hollows where there is always snow One man then lies down in the snow or buries himself in it A dog is sent to look for him He is nimeer in it A oog is sent to look for him. He is taught to bark when he has found the man and also to rouse him up from sleep by licking his face. When the man wakes up and stands on his feet the dog leads him to the hospiter running on in front to show him the way

According to the traditions of the monastery the St Bernard is a cross between a Danish bull bitch and a mastiff a native hill dog though at what time the cross was effected it is impossible to say After the breed was once established it was kept pure until 1813 when owing to the severity of the wister the monks were obliged contrary to their usual custom to send out the brood bitches as well as the dogs with the reout the broad bitches as well as the dogs with the re-sult that all the females surcumbed to the cold and the monks found themselves without the means of con-tuning the pure broad. In this extremity a cross with the Newfoundland was tried but at first failed owing to the sconsive coat of the Newfoundland, which hampered the dogs in the more however, but preceding back to their own abort-coated dogs, the

scalar electrical the desired shortness of cost, though econotonally specimens were born with the rough costs. These rough-costed and size were sold or given away to the inhabitants of the surrounding ispeciages were born with the rough ceals: These rough-costed and sough were sold on given sway to the halabitants of the surrounding validars, whe continued to breef them so that St. Bernard dogs seen because general in Switzentand. The full grown specimens in the benach at the houples are magnificent creatures of their kind They stand thirty inches high at the shoulder and weigh about one hearing and fifty pounds. They are exceedingly strong and can carry a man for a condisionable distance. By nature they are gentle except in the puppy season when the mothers are agic to research

statestions.

This hand of faithful creatures commance their work in earnest at the end of September and continue looking for lost travelers right on to the middle of June which period represents the vinter season on the pass. In the depth of winter not a variety of a path in widthe The mow drifts too present formidable obstacles. Besides there is the danger of avalanches Flogs are frequent and in storacy weather the wind rises to a lurricone blowing the mow first ones eyes and making it impossible to see any distances aband.



Great St. Bernard hospice in winter Such extraordinary in the Alp

ions There are over one I indred bods for travelers and they a sever cmp y during he win or mon is Of n he me ks are called upon to find at liter for as many as thre hundred or four hundred persons at one time No one is sake! u lay for his nungrad persons at one time No one is asset o lay for his a commoda fon Vory few dr p in o h alims tox in the bes sit ful chapel th amount that would have b [z i for similar accommodation at an ordinary h el Henc the m satery must depend to a very large oz ent | on other means of support Un depend to a very large on ent | on other means of an port | on other means of an port | or of trunkely to other expenses ar very hear y for all nots all sapplies have to ome from Aosta and the neighboring villages Th monks he as deep cellar wh re they he p heir where unfor sen Frash ment is precured from the valleys in 1 assumers but for the winter the priests lay up as ore of said emeat. Thoy also the winter the pricess may up a s ore of mail of mean. I may amo k ep a number of lows in the sun ner to supply he n with milk lutter and cheese but only o e cow is re sin d in the winter Wood for firing is one of the most important necessaries. Not a

noon or aring is one of the most important necessaries. Not a sitck grows within seven miles and all the fuel has to be brought from a forest on the ba ks of horses. For this purpose alone about thirty lorses are employed daily during the brief summer.



Entrance to the St. Bernard hospice

Indeed the monks will not heatate to tell you that during the winter months it is impossible for an in

curing the winter months it is impossible for an in-speriment furwher to venture upon the mountain and sayer insequence to venture upon the mountain and salely negotiate the pass without receipt help Considering the perils of the road one may well sake why people venture upon it during the winter. The fact is the greater majority are poor workness going or returning from their labors on the other side of that Japan Taybrary and March as many as a hundred will make their very serves the pass in a single say-ing of remaining out in the sure seeking the lost, for twenty four hours at a time Tather Darbellay tol-ting the seeking of the same seeking the lost, for twenty four hours at a time Tather Darbellay tol-te the same of the same seeking the lost, for twenty four hours at a time Tather Darbellay tol-te that he has known the degat for remain out in the mow for two days eating very little and not taking any rest or sides.

many rest or sleep

Before the advent of the telephone the dogs carried
a fagon of wine tied to their collars and food strapped
to a saddle on their backs. Now they carry only the
wine because it has been found that the weight hin ders their progress through the snow So well are they trained, that they are often dispatched by them ders their progress through the snow so well are they trained, that they are often dispatched by them salves down the peas to accord travelers up the tracelular street of the solid travelers. In the same way the month will allow the day to accord to the way the month will allow the day to according to the way the month will allow the day to according to the way the month will allow the day to according to the tracelular is at all held and the read difficult to tracel if a traveler is found in and channels continued to the tracelular tracelular

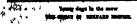
The following notes concerning the storage of California or crude oil in concrete reservoirs were recently given in Concrete A 1 00 000 barrel reservoir lined with concrete has recently been completed at Port Rich and Cal and one of 600 000 barrel capacity is under construction near Bakerelled The practice is to exca wate the earth which in most fields is a sandy loam porous and very dry to about one third the de; h of the proposed reservoir With the material removed a lever is built round the excavation having side slopes of



Training a deg with dummies to dis

1 1½ on both faces. The bottom and sides are then covered with about 3 inches of con-crete often reinforced with expanded meta or some equivalent. Small cracks that or unat the junction of he sides and bottom and along the line between the cut and the embank ment soon become filled with sediment and are believed to permit the leakage of very little

off A number of such structures in Southers California have recently been examined and ne signs of depreciation in the quality of the con-crete were found even in those which had been in use for a considerable period



### THE REAVERS IN JANUARY



B we watch the brighter stars on a clear winters night we may well be impressed with the notable differences in color among them What may strike us first is that a very bright star like Strina when low on the horison visibly hanges color from moment to moment This is like its

tvinking jursty an effect of our simosphere whose retraction changing signity as masses of air of different continuations of the different continuation of t

But when the stars have risen high and the night is clear and calm so that these disturbances are no longer perceptible the differences of color persist Sirius is brilliantly white and so are most of the stars of Orion Capella (whose light much resembles that of our sun) is clearly yellow Aldebaran is orange red and Betelgeux redder still. The fainter stars whose light is too weak to show much color to

the naked eye when ex show similar differences in

nomena so easily observ able must be sought in the stars themselves Re cont i bysi al research has that we may find it in tleir temperature

If we take a solid body such as the carbon file ment of an incandescent lamp and heat it up grad ually to higher and higher temperatures which in this case we may easily do by increasing the elec-tric current—we will ob serve that when it first be-comes visible its light is of a dull red. As the cur rent is increased the light becomes very much brighter and yellow in stead of red

If finally we apply a very high voltage and put through the lamp a heavy current whi h it can stand only a slot time withou only a slot time without breaking down it will give for the moment an intense white light far whiter as well as far brighter than under ordi nary conditions

All in andescent solids er liquids behave in the asme way and careful work both in the labora tory and on theoretial lines has led to a formula (too compil ated to be given here) which enables us to tell just h w much light of any given color (or wave length) will be

(or way lockin) will be given off per square into hof auriace at a given tem perature. We annot of course experiment with tem peratures as bigh as those that prevail upon the sun but there are good reasons to suppose that the formula flus the facts very losely even in this case.

We may illustrate its results by an example sider a star of the same temperature as the sun and suppose that we observe it. (1) through deep red glass whi is transmits only the extreme red rays (2) through the properties of the extreme red rays (3) through a yellow glass transmitting only the pellow and green light (3) by photography when the violet rays are all me effective. Now suppose its temperature meddanly doubled. Our formula tails us that through th red glass it vill look about seven times as bright as before through the yellow glass more than ten times and by photography some twenty times as

If on the other hand its temperature was reduced to half its initial value its light would fall

to balf its initial value its light would fall of much more rapidly the red to 1/46 the reliew to 1/100 and the blue to but 1/400 of its original amount 5 suppose now that we had invest eater close together in the sity whose surfaces were at the three temperatures just discussed Which of them will look bright cet to us will depend on how big they are and how far away. Let us imposes that, whered through the

yellow giass, they all seem equal in brightness, in which case the hottest case must of course be much analier or much more remote, than the coldest. From the aussiers just given we can deduce that, been seen through the red giase the hottest risk was ment to per cent as bright as the cone which resemble the sum and the coldest risk rivier as bright seem but 70 per cent as bright as the convenient of the photography of the contract of the photography the dispersary of the comparison. On the photograph the dispersary was bright and the cold star only one quarter as bright as the one of the solar type We have thus a means of determining their tempera-

We have thus a means of determining their tempera-

We have thus a means of determining their temperatures even though we do not know how far off they are nor what is their sectual brightness by comparing other relative hypitoness in light of different colors An extensive series of observations of this sort have recently been made all Potadem by Scheiber and Wilhing using appearatus of high precision and great care to avoid all sources of ever and employing five care to avoid all sources of ever and employing the different colors of light so that the comparis values obtained from them might serve as a check not only upon the accuracy of the observations
of the formula used in calculation

The results are highly satisfactory and form an im-ortant contribution to our knowledge of the stars. As is obviously to be expected from what has been

cone. In the expellence, Eligh my almost everybode, in Therem, marked by the group of the Philopies and the red Alfolderam, Bollow is the splendid Grice, and is-ments him Castle Rajac with the incomparable first-ine. Bast of the security is a stress of the second section star Chapita. Below gar the Twins, and an the right-in the comparable of the comparable control of the Process. The Bast start cluster Processes marks the

place of Cancer and on the horis Lee partly rises. The constellations in the south

The constellations in the scothwest are much less promisent. After which is high up on an et once be recognized by the peculiar small triangle formed by its three principal start the faithest of which y is a fine double. Our initial shows how ridiushously likely and the stars which bear his name. Bridanus Cutts and Pieces are noos of them very bright but the planets Mars and Seturn which see close together in the isst are completions. The very brilliant object in the southwest early in the evening is the blanct Venus.

is the planet Venus.

is the planet Venus.

Pegamus and Andremeda are well seen in the west
Persons is right overhead and Casatopeda Cephens
and Cyganus occupy the Milky Way as far as the
northwestern horizon Ursa Major is coming up in the
northwest coming up in the
northeast.

THE PLANES

Mercury is evening star until the 26th when he passes between us and the sun and becomes a mern-ing star. He is wall yet the during the fact half ing star He is wan varible during the first half of the month especially about the 10th when he eats about \$ 15 P M He sets about 6 15 P M is then in Capricornus far from any bright star and should be easily identified Venus is exceedingly bright and conspicuous es-pecially at the beginning of the month when she sets about 8 10 P M By the and of the month she has come nearly into line be tween us and the sun and is less prominent setting about 7 P M but is still

far brighter than any thing else in sight Mars is in Pieces at the beginning of the month close to Saturn and grad ually moves eastward into Aries He is in quadra ture with the sun on the 17th and is on the meri dian at 6 P M Viewed telescopically he shows a marked gibbous phase— like the moon three days

Jupiter is in Virgo and rises about midnight be-ing in quadrature with the ing in quadrature with the sun on the opposite side from Mars on the 4th Saturn is almost opposite him in the sky in Pisces and is visible in the even ing almost till midnight

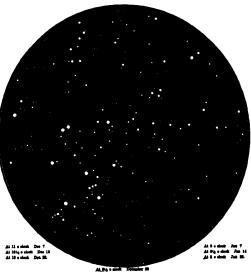
Dranus is in contuwith the sun on the 11th and is invisible throughout

the month Neptune is in opposition on the 8th and is visible all night long. He is then in R. A. 7 h 17 m 28 a declusation 21 deg 25 min N and is moving 71 s to the vest and 14 sec. northward daily His motion alone serves to distinguish him from the stars unless one has a telescope powerful enough to show

Last quarter occurs at 8 A M on the 3d new moat 7 A M on the 11th first quarter at 5 A. M on the 18th and full mora at 7 A M on the 25th. The moon

is nearest us on the 17th, and furthest off on the 4th and 31st. She is in continuation with Juniter on the 2d The see is nonjunction with Jupiter on the 30 Uranus on the 11th Mercury on the afternoon of the 12th Venus on the 12th Satura on the 17th Mars on the 12th, and Jupiter once more on the 20th. Princeton University Observatory

The memory of the late Capt. Charles W Gridler, who was Admiral Dawey a flag officer on bearst the cortiser Gympa as the bestie of skants, layer in 1884, has been beneved by a brease memorial tables which has been placed on the wall of Memorial Japan, in Bancrott Hall Appairable. Md. The france print approach to the country of the cou



NIGHT SKY: DECEMBER AND JANUARY

and the white stars are the hottest. The average temperature of those observed comes out about 11500 deg C just about challe had been comes out about 11500 deg C just about double that of the sun The average temperature which they calculate for a number of stars whose spectra resemble the sun's is 500 deg —a. little higher than that of the sun itself That of the start which resemble Arvirurs in sportrum as 400 deg and that of the reddent stars like a star of the start carbons in the electric are (The art light of course looks far bluer than most stars but this is because toots are nuer than most stars but this is because much of its light comes from hot carbon vapor which like the mercury vapor in the now familiar lamps gives off strongly colored light of its own in this case violet!

A rather faint telescopic comet was discovered by Mr Daniel at Princeton on the night of December 6th aber 6th Mr Daniel at Princoton on the night of Documber this was then should firly million miles from we and very close to perhabiton it is new slowly receding from earth and sun bet will remain take-copically viable until the end of January or later. Halley's comet though well placed in the evening sky in Pieces not far from Mars and Satures will probably still be unject to high the see without a tolescope why will be made to high the see without a tolescope when the probability of the see without a tolescope without a tolescope when the probability of the see without a tolescope when the probability of the see without a tolescope when the probability of the see which we have the seed of the seed of

The finest region in the starry sky is now well

### THE RESPONSIONAL STREET, OF TAXABLE

ent state of science, the solution of the m of vision at a distance by means of electrical mission appears to be only a question of money rehes in this field are directed toward the utiliza-Researches in this field are directed toward the utiliza-tion of a possifar property of the element selentum, which conducts electricity more or less readily in pro-portion to the intensity of the light which falls upon it Upon this property is based the system of electrical Upon this property is nessed the system of sectrical transmission of photographs which was invented by Prof. Korn, of Munich, and which has for several months been in regular operation between the offices of the Dally Mirror in London and L Illustration in Paris The general arrangement of Korn s appare has already been described

in the Scientist Assess CAN The photograph to be transmitted a negative film, is wrapped round a cylinder which is caused to rotate before a source to rotate before a source of light to arranged that only a very small area of the photograph is illuminated at a time. The pen cil of light after traversing the film falls upon a coll of selection formation of the coll of selection of selection of the coll of selection o

Owing to the property of selenium mentioned above the cur reat which flows through this selenium cell at any reat which now a trough its seienting out at any instant is proportional to the transparency of the negative film at the point traversed by the pentil of light at that instant at the receiving station this flutus ating current is employed to uncover to an extent proportional to the instantaneous strength of the cur proportional to the instantaneous strength of the cur rent a lass which couvers a beam of light upon a photographic film carried by a cylinder which relates in synchronism with the cylinder at the transmitting station. Hence the part of the film on which the beam falls is illuminated and consequently blackaned to a degree proportional to the transparency of the corresponding part of the original film. In short a negative at one station produce a positive pletter at the other by the successive transmission of many the other by the successive transamall parts

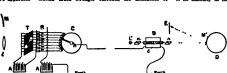
Instead of prolonging the operation in this m Instead of prolonging the operation in this manner that suppose that its sall done at once. Let us project the image upon a sheat of selenium divided into a very large number of small colle each of which is connected with the receiving station by a separate wire it is evident that in this way the entire piture could be transmitted at once and consequently that electrical vision at a distance could be resulted. Fat in order to accomplish this thousands of wires each connected with appropriate apparatus, would be required and the suppose incurred would probably be out of all proportion to the value of the passults obout of all proportion to the value of the results ob

This theoretical scheme has not formed the basis of any practical experiments which have yet been brought to public notice. It was announced a few menths ago that E Ruhmer the well known electri-cian of Berlin had solved the problem and that his apparatus costing an enormous sum to construct would be the principal attraction at the Exposition at Brussels in 1910 No details of the apparatus how ever have been published. We know that it employs enium but we do not know whether it uses one

satestime but we do not know whether it uses one wire or many wires.

In Ma state of the problem it seems particularly interesting to note the solution proposed by two French inventors. M Rignoux and Prof Fournier some of whose experiments the writer has had the good fortune to winess.

Rignoux and Fornier have invented two types of apparatus. The first is designed mersiy for demon stration and necessitates the employment of many wires it may be described briefly as follows at the transmitting station on object (a large letter of the alphabet for example) is strongly illuminated and its image is projected by a lens upon a rema-containing a number of selentum cells each of which is connected with the receiving station by a separate containing a number of scientius cells each of which is connected with the receiving station by a separate wire Bisch cell, and its wire, transmits a current proportional to the hrightness of the part of the in age projected on that cell and the corresponding part of the object At the receiving station these simulta-neous currents of unequal intensity travers an equal number of little cells, and thereby uncover the same number of little mirrors to an extent proportional of the strengths of the surface currents Beams of light the strengths of the various currents Beams of light redecide by these infrores are protected on a case, side by side, forming maches of various degrees of trightness, proportional to test of the corresponding parts of the object. With a 'buy' sarps number of sidentess solits, wires, coils, and univers it would be possible to trademic is picture with fine detail and plany gradations of trans. The experimental deman-plation, valued in acquairy made in summary and crude, but quite convincing. The multiplicity of wires is a serious defect, which the inventors believe they have found means of remedying in their second apperatus which is in course of construction and is illus-trated by the accompanying diagram. At the transmitting station the rays of the luminous source L are reflected by the mirror M upon the object O the image of which is projected by the lens I upon the frame of selenium cells T (The diagram shows a frame of eight cells and an object divided into eight equal Two of the squares are white and their ages illuminate the two corresponding selesium cells.)
The very weak currents transmitted by the selesium cells are sent into the relay R where they set into motion much stronger currents, the intensities of



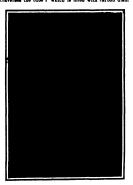
THE RIGHOUX POURNIER SYSTEM OF TELEVISION

which are proportional to those of the scientium call currents to the illumination of the respective cells d to the brightness of the corresponding parts of the

object. The problem is to transmit all of these currents through a single wire without confusion and to receive them and cause them to act separately and simultaneously at the receiving station. For this purpose Rignoux and Fournier have devised the fol lowing arrangement. The currents are convoyed to the contact pieces of the collector C from which they are taken successively by a rapidly rotating wheel which is connected with the receiving station by a

Let us for the moment disregard the question of poed of transmission and consider the means by

speed of transmission and consider the means of which these successive currents are received. At the receiving station the light of a source L polarized by its passage through the Nicol prism a traverses the tube f which is filled with carbon disul





phide, and then falls upon a se which is crossed with regard to the first prism which is crossed with regard to the first prism the tube is surrounded by a coll of wire B which is connected with the wire coming from the transmitting station. Hence the currents which traverse the selen ium cells for the transmitter flow successively through ism calls for the transmitter flow successively through this cell and profuse an electromagnetic rotation of the plane of polarisation of the light which is passeng through the earbon distubble to a digree proportional to the illumination of the particular selection cell which is momentarily connected with the line wire causing corresponding fluctuations in the intensity of the light which energies from the second Nijodi primes of This beam of light of varying its couldn't falls upon the cylinder D which rotates in synchronism with the collector  $\mathcal O$  at the transmitting station, and which carries a number of mirrors M', equal to the number of selection cells Hence each mirror redects a quantity of light proportional to the illumination of a particular selection cell and the brightness of the corresponding part of the object. The mirrors are so arranged that the light reflected by each falls on a different part of the streen E on which is thus produced a mosak picture formed of patches of various degrees of brightness of the object exposed at the transmitting station

It is possible to transmit and make visib! in this manner employing a single wire an image produced by several thousands of selenium cells? Yes There is no difficulty in constructing a frame of 100

more scientum cells each connected by a separate wire with a collector which emprises an equal ly large numb r of con tacts Now if we remem alternation of an alternat ing current often exceeds 100 000 cycles per second it becomes evident that 10 000 currents can be col lected and transmitted successively over a single wire in a small fraction of

a second By the employment of 10 000 mirrors at r ceiving station an image composed of 10 000 patches of light can be projected within the same fraction of a second The different parts of the picture will a slly be projected successively but they will appear to be simultaneous owing to the punistence of im pressions on the retina of the eye if the projection of the entire picture is accomplished within 1/40 second and the apparatus can be so constructed that this process will be repeated indefinitely giving the appear ance of a persistent picture instead of a feeting

Hitherto we have supposed the number of mirrors to be equal to the number of selenium cells. It may be found possible however to diminish the number of mirrors and to operate each mirror successively by of mirrors and to operate : ach mirror successively by the currents from several (cils. This modification could doubtless involve complications and difficulties in construction which we need not discuss. For the present if suffices to show that the problem of vision at a distance by means of a single wire connecting the two stations has been solved by MM Rignous and Pournier in the practical realization of the de-and Pournier in the practical realization of the degired result the inventors will have to reckon with the phenomena of self induction interfere electric inertia of selenium but these are familiar technical difficulties which will sooner or later be sur

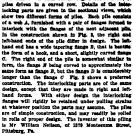
### DAVID STARR JORDAN

The distinction of studying natural history under Louis Agnasis in the laboratories in Cambridge is one to be highly appreciated and of the many ciminent naturalists who were so fortunate as to re-crite their first impiration under the guidance of that renowned measure many if not most have ceased their artivities. Of the saritar students Brooks Hyatt and Packard have joined the silent Brooks Hyst! and Psckard have joined the silent majority Alexander Agassis Pultans Scodder and Verrill are fortunately still with us in the happy non session of an assured fame. At the close of the clder Agassis a career he established a numner school on Penfices island and of those who studied there two have achieved especial distinction. But hard Rathban the Agastant Sierekay of the Smithsonian Institu the Assistant Bevretary of the Smithsonian matter tion who is now directing the activities of a score or more of vouncer men in the work of the National Museum and David Starr Iordan who presides over the destinies of the great Stanford Indiversity in Call fornia Prof Jordan has ben called to presid over the meeting of the American Association to be held this week in Boston and of him is the following brief

David Starr Jordan was born in Gainesville New York on January 19th 1851 and grew up on his fathers farm in Wyoming County receiving his early fathers farm in Wyoming County rectiving his early columnts in achools in the vitality of his home in 1888 he entered Cornell and there devoted himself to be coleculated under devotoping a special interest in bot any in which branch he was made instructor in his pulsor years and continued to hold that place until he has been continued to hold that place until he has a called to the chair of natural history of Combard Indivestity in 1872. A nince which he held

He was called to the chair of natural history in Lombard University in 1872 a place which he beld for a year and then accepted the principalship of the Appleton (Wis) Collegiate Institute. He then entered the Anderson School on Penfices Island as a student and lectured there on marine botany during the sum mer of 1874. It was there that he came under the influence of the elder Agassiv and began his studies (Continued on sage 18.)

plie with macher are agt to m when the piles are under strain. Pictured herey is a new form of sheet piling with strong field is a new form of sheet pitting with giving fasti-points, so constructed an to oppose bryesding; sint at the various positions which the pilot may new with relation to seek other. Fig. 1 shows a set pilot drives in a curved row. Details of the in-stance of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of





A north form of gas-main stopper is likewised in the norman-part of gas-main stopper is likewised in the scenimary of the sce at B Connecting opposite extremities of the oval shaped spring frame A are a pair of telescoping mem bers C, to which the operating handles D and E are attached. It will be evident that when the handle # is drawn upward and handle D pressed downward, the member O will telescope, drawing the frame A into cir-cular form. In order to provide for operating both of cular form: In order to provide for operating both of the handle here simultaneously, a croushand F is fitted to the outer end of the her D, and is provided with an aperture through which a threaded her G is adapted to pass. The her G terminates in a hook, which sa-gares a lith secured to the her Z, and a thumb not ages as this secured to the her Z, and a thumb not hand P serves to draw the her Z outward, and at the same time to present hele PI haven's, on at to present the stopper into the circular form. In use the stopper into the circular form: In use the stopper, and introduced into the gas main through an opening. introduced into the gas main through an opening, and inclined with its lower end extending toward the end inclined with its lower and extending toward the and from which the gas is flowing. The operating bars project through the opening, and when the thumb nut is tightened the frame is brought to a nearly vertical position, as indicated in the drawing, thus Jying crosswise of the main and effectually stopping the flow of gas. The inventor of this improved gas-main stopper is Mr Patrick Goodman of 257 East 183rd Street, New York city



A HOVEL METHOD OF COOPERING CAMES, It is outsomary to build casks with tapering sides, so that the hoops which bind the staves together may be jammed tightly in place. This makes it necessary to shape the staves, which entails considerable waste or material and much rouble in assembling and benefits the therefore the control of material and much trouble in assembling and bend-

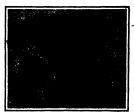
of metal that is crimited or bent into a signage form. This lightmean the construction, and pro-vides a better grip on the hoops and stave. In many trades small keps and catave. In the many trades small keps and catave of moderate size for liquids are required, but their high price and the cent of machinery for making them is prohibitive for many purposes. The casks here described are separately satisfied to meet the requirements of such trades, because after the staves and heads are prepared they can be finished inside and out (Including only ting the growthm) in an ordinary inthe, produc-ing an inergensive cask of attractive and fin-ished appearance. The invastor of this more construction is Mr. William Houlker of Neilson, New Sepaind.

not, and a pumber of polt the plate depends upon the dine The drawing on which the ed over the plate, and to prote



GAS-MAIN STOPPER.

lined is then filled with the iron balls, which are find on the under side to prevent them from rolling. The magnetized plats converts the balls into temporary magnets, causing them to cling to the plate and to magnets, causing them to cling to the plate and to cash other. After the area of the drawing is filled, cash other. After the area of the drawing is filled, frame, as indicated in the segretne, and the number of square inches occupied by the fails is secondaried. Tables are turnished which permit or reducing the square inches thus found to the scale of the drawing, thus giving the area sought without any solutiation. It will be observed that the side members of the meas-

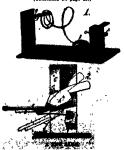


AREA-FINRING APPARATUR.

uring frame are calibrated, and the aliding cross-bar is provided with vernier scales, so that the area occu-pied by the balls may be obtained with exactitude. se with which any given area can be set on first The ease with which any given area can or set on area trial should make this apparatus valuable to engineers and surveyors. The apparatus is adaptable to irrequal to a well as regular surfaces. The inventor of the area finder is Mr Alfred C Freeman of Norfolk, Va.

### A MRW GAME.

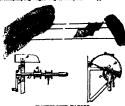
Pictured in the accompanying engraving is a novel game apparatus, which is adapted to afford consider-able recreation, as it calls for a certain amount of skill. (Concluded On page 28.)





CLOTHER-LINE HANGER.

The clothes-line hanger which is illustrated in the accompanying engraving is adapted to support a num-



CLOTHES-LINE HANGER

ber of clothes lines at the same time, and yet permits of taking up the stack of the lines individually or alto-gather when desired. The lines are attached at one end to a fixed support, while the other ends are con-nected to separate rocks, all of which are mounted on a single shaft that may be wound up to stretch the lines taut. The shaft, which is indicated at A, is prolines taut. The same, where is indicated at A, B) provided at intervals with square sections adapted to fit the square borus of the reels B. The shaft is mounted in suitable brackets attached to a wall, and at each end is provided with a ratchet and a crank, so that it may be wound up to tighten the lines. Each line is provided with a hook at one end adapted to engage a

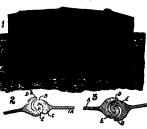


A HOVEL METHOD OF COOPERING CASES.

corresponding eye in the bar E, which is made fast to an opposite wall or other support. Whenever it is de-sired to take in one of the lines, or to tighten it or loosen it with respect to the others, the reel on which it is wound is moved axially until it clears the squared section of the shaft A, and is then free to be turned in either direction. Whenever desired, the bar Z may be released from its support and the lines wound up A cover piece D may then be dropped over the reels to protect them from the weather A patent on this cother-line hanger has been obtained by Mr George T. Van Riper, 152 South Ocean Avenue, Freeport, N Y

### ROLLED STEEL PILING.

One of the defects of sheet steel piling as heretofore constructed is that the interlocking edges which con-



BOLLED STREET, PILIPS.

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CHAIR.—W P Lavaners, Colorede Springs.

Cho, The investigation has reference to certain ingerensents in meral chairs, the main object of the invested being to construct a celler, the sentence of the invested being to construct a celler, the sentence of the construction of the construction of the construction of the parts of which are no consected upperfered that all rivers, bullet or other fastening means are consolled from view Walkindowskirthin—S. Rarriero, Scrience Walkindowskirthin—S. Rarriero, S. Ra



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## NEW BOOKS, RTG.

Your. Compiled by Frank Bergen Kolley. New York Ferderick A. Stokes Company, 1909. 18mo., 420 pp. Price, \$150

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CYBUS HALL McCommick his Life and
Work. By Herbert N Casson Chicago A. C McClurg & Co., 1909
12mo., 284 pp Price, \$1 50 net.

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## **PATENTS**

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OXTORN AND MUMAN BREBOT. (Concluded from page 6.)

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hand, when Ltl was negotiated, expen-condensare were used, and by breathing this gas the top was triumphantly reached with but little of the distress that was experienced on Popo II these that was experienced on Popo II these there are not been supported to the control of courty in scaling the world's highest peaks should be eliminated, even Eversat (24,000 feet) should be conquered, and almost amy fart climber should be able to find that fing alleged to have been almost any fart climber should be able to find that fing alleged to have been But other procedures are being affor-cated which do not appear to me so just shalle For axample, Dr. Jaconard Hill

Sable For example, Dr. Leonard Hill has been seeking to prove that oxygen is more sustaining than air, his experi-ments demonstrate that after the use of this gas one may hold the breath more than nine minutes. I do not know what proportion of oxygen was used in the experiments, whether the gas was taken pure, or whether some compound of it pure, or whether some compound of it was supplyed. The recult is stated is of course anneating, but it is not exceptional Trained and expert swimmers remain under water a number of minutes, when, of course, they have to hold their breath II memory serves une aright. It is a tank under water was the property of the pr The state of the s before a quarter-mile race, an athlete should be able to hold his breath during the whole race, and devote the energy thus saved to faster running Somewhat more than a year ago, Dr Hill reported

Star "Star" Lethes

Engine and Foot Lather ACHINE SHOP OUTFITS, TOOLS AND UPPLIES SERT MATERIALS SERT ORKEANSHIP GATALOGUE FREE TIAN LATRE GO., 120 Outset St., Ginelann

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## Concrete Reinforced Concrete Concrete Building Blocks

Seinntific American Supplement 1548 contains an article on Concrete by Brysson Chiningham The article clearly describes the proper com-position and mixture of concrete and gives results of claborate tests.

concerns American Supplements 1507, 1508, 1509, 1579, and 1577 contain as atsorrers discussed by Lovet. Heary 7, Joseph Congress on the control of the contr

tife American Surplement 197 contains a ele by Spancer Rewberry In which pro I notes on the proper preparation of on in are given. similife American Supplements 1868 and 1868 present a helpful account of the making of concrete blocks to Sunner Services. Selectific American Supplement 1996 gives a critical review of the engineering value of

beautife American Servicement 1881 contains the principles of Printerest Querrole with man practical United tions by Walter

London Rospital arbietics expi London Recupent analottes express was given to nome of the remain immed-sizally actor the remain and greatly re-lieved their distress. A well-known ash-lets, Mr. Holding, run a unposed qua-ter of a mile in fitty seconds after breathing oxygen for three minutes; is the trial for the Clympian games he had been unable to do this in less than fiftytwo seconds. It seems he was not more distressed than if he had run one hus dred yards; there was, it was reg a notable absence of that stiffness muscles and grogginess in the lege which muscles and grougeness in the lags which follow great exertion in running. An-other athlete, Mr Just, after breathing oxygen for three minutes, ran half a mile in one minute and fifty-five seconds, slightly beating his record. lightly beating his record.
I confess I am not much impr

these achievements. I think, on the con-trary, the preliminaries to them were trary, the preliminatives to them were reprehensible. Oxygen in a stimulant, and it is for its stimulant properties that Dr. Hill advocates its use in athleton. This is especially bad for young men, who are generally our athletes. You should need attituition. Wooderve, moreover, the oxygen is given before a more bittle oxygen in the contract of the c Human energy is thus increased, but the increase is abi increase is abnormal, as is also the ex-ponditure of energy. Nor are the se-quelss without disaster Do not our ath-lette young men, as it is, grow into ma-turity with bad enough hearts? Every doctor must give melanchely testimony that such is the case But here we are that such is the case But here we are advised to attituate unnaturally a heart already functioning to its limit. And it is unphysiological to give any stimulant before a feat of strength or a trial of oderance, capabilities are than perversaly and unnaturally oversrought. All stimulants—orgam, whistly, coss, and the like—should be given not before, but after, a race, a journey, or a mountain climb, and the property of the person of the contraction of the person of the perso

economy to par arror the unaue exertion. Here is a matter which seems to me not altogether trivial. Besides, this "doping" of contestants before a rose is unsportsmanliks. Tests of physical brawn and endurance are legitimate only when they are made un-der normal conditions—those in which human life must ordinarily be lived. The true sportsman will countenance athlet ics only when the contestant depends for ics only when the contestant depends for success upon no other factors than his better physique and superior skill. Oxy-gen stimulation would possibly make an untrained, undeveloped, short-winded, untrained, undervaloped, short-winded, soft-munical specimes successful for the brief span of a given contest; but for all that he would be the poorer and not the better man. It may be recalled that some years ago a birtylist 'made' a mile in less than a minute, behind a rathus print print grid that rate; a month bester out the search of the search and the search He was thus protected from the winds, especially headwinds, and was moreover assisted by the suction exerted by the fast-moving train. Genuine sportsmen rightly held his record to be valueless; for it was achieved under unnatural con-ditions, not under such as must be chanced and grappled with in nature.

DAVID STARR PORDAY.

## d from page 18.) .

of falses, in the knowledges of which he now stands among the very forement in this country. In 1876 he was elected to the professorship of biology in Busher University, which place he them held un-

\* By otherwised to have treased on squary specifies to an By elements in term resent on report pulling to ended reports in term resent on report pulling to enspecial products. The physician designed are produced on special products on report in elements which produced reserved products of products are products of pulling and energy. These are also resided, interaction, all the energy in these are also resided, interaction, and the energy in the products of pulling the area of the energy in the products of the energy of the energy in the energy of the energy of the the property of the course of the thin.



(Continued from page 16.)
til 1879, when he was chosen to fill a
similar chair in the University of Indi-ans, in the possession of which he con-tinued until 1885, when he became presi-

dent of that university
In 1885 Leland Stanford, who served the State of California as its Governor and as its representative in the United States Senate, founded in memory of his son the Leland Stanford Junior University, having as its object to "qual ify students for personal success and diiry students for personal success and di rect usefulness in life." This university with the richest foundation of any simi lar institution in the United States a that time, was formally opened on Orto-ber 1st, 1891, with Dr Jordan as its por ist, 1891, with Dr Jordan as its president. Since that time be has con tinued to fill that important office, ful silling with rare skill and unusual ability the will of its founder, who publicly said that "a generous education is the birth right of every man and woman in America".

Dr Jordan's great knowledge of fishes Dr. Jordan's great knowledge of fishes was early taken advantage of by the U S Bureau of Fisheries, and from 1877 until he went to Stanford University he served as assistant to the U S Fish Commission, as it was then called During 1886-80, as it was a U S commissioner in charge of the sessing investigations, and in 1984 when the commissioner of the session of the session should be certain investigations, and in 1984 when the commission of the session o ernment. In connection with his offi searches he has made many trips on the Pacific, frequently visiting Alaska, Hawaii, and far-away Japan, making lawaii, and in-away sapan, maning large collections, selections from which, especially types of new forms, have been deposited in the II S National Museum Of the publications of this institution, he prepared as "Contributions to North American Ichthyology," three bulletins American ichthyology," three bulletins cuttilde respectively I "Review of Rafnesque's Memoirs on North American Flahes" (1877), II A "Note on Cottide, 
Etheostomide, Pertide, Centrarchide, 
Aphododeride, Dorysomatides, and Cyprinide, with revisions of the genera and descriptions of new or little known spe descriptions of new or little known spe-cies" B "Bynopsis of the Silurida or the freah waters of North America" (1877), and III A "On the distribution of the flabes of the Allephany region of South Carolina, Georgia, and Tenaesee, with descriptions of new or little known spe-cies" B "A Synopsis of the family Ca-touriomide" (1878)

tionsommer (1878)

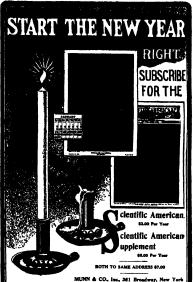
He has further enriched the many volumos of the Proceedings of the U S National Museum with accounts of his discovertes, which have gained for him the
reputation of being the foremost author ity on the sea fauna of the Pacific By far however, his greatest contribution to the Smithsonian publications is the well the Smithsonian publications is the pre-known Bulletin No 47, which he prepared in co-operation with Barton pared in co-peration with Barton W Everman II bears the title of "The Flahes of North and Middle America." And is essentially a dost ripitor catalogue of the species of fish like vertebrates found in the waters of North America, north of the Isthmuss of Panama. In it are described 255 families, 1,438 genera are described 255 families, 1,438 genera and 8,248 species and 6,248 species and of covering a 2,138 perior size to the con-ception of the species of the con-traction of the contraction of the con-ception of the contraction of the con-traction of the contraction of the contraction of the conspecies It forms four octavo volumes covering 3.315 pages with 329 plates, in which nearly 1,000 fishes are illustrated Dr Jordan is also the author of "A Manual of Vortebrate Asimals of Northern United States", "Animal Life", "Animal Furns", "Food and Game Flakes of North America", and "A Guide the Carte of Flakes" (Sevent of these the Carte of Flakes"). to the Study of Fishes." Several of these works were written in association with his scientific colleagues of the Bureau of Fishes and Stanford University.

Fishes and Stanford University.

His more popular contributions to literature include the following works in book form: "Science Sketches", "Foot notes to Evolution", 'Care and Culture of Men", "This Innumerable Company", "Importal Democracy", "The Philosophy Tologo of the Scholar", "The Cull of the Twestisth Century The Could of the Twestisth Century The Could of the Twestisth Century The Could of the Twestisth Century The Country of Concluded on page 12.)

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(Concluded from page 17) entitled "To Barbara." M verse entitled "To Barbara," Many these books are collections of his lect and addresses before popular audiences for Dr Jordan has always been in de

mand as a speaker from the lecture plat-Many honors have come to him degree of MD was conferred on him by the Indiana Medical College in 1875, that of Ph.D was given him by Butler Uni-versity in 1878, while that of LL D was versity in 1878, while that of LL D was contered on him by his aims mater 1886, and by the Johns Hopkins Univer sity in 1902. He is a member of many scientific societies, including the Ameri-

necession societies, including the American Philosophical Society, and during 1896-8 he was president of the California Academy of Sciences Besides the foregoing he is a vice president of the Carne gie Foundation for the Advancement of

Touching.

vancement of Science enrolled his name among its members at its second Montreal meeting in 1882, and a year later he was advanced to the grade of Fellow The section on Biology made him its vicepresident for the year 1895, but absence rom the country prevented him from ac cepting the office on that occasion Ac-cordingly in 1900 he was again chosen, and presided over the section at the Denor meeting, delivering a retring aggress on "The Fish Fauna of Japan with Ob-servations on the Geographical Distribu-tion of Fishes" At the meeting held in Baltimore a year ago this time Di Joi dan was the unanimous choice of his sel entific associates for the highest office in the gift of the Association, and will take the chair at the Boston meeting

### A WEW GAME

(Concluded from page 1))

It consists in general of a peg pro-vided with a set of recesses which are numbered 5 10 15, etc and a projetting device adapted to throw a ring on this peg, so that it will hang from any one of these recesses. The project-ing device casts the ring in such a way that it turns a complete somersault in transit, which adds to the difficulty of making the ring full in the recess bear making the ting fail in the recess war-ing the highest number. The projecting device is shown in detail in cross-sev-tional view. It consists of a lever 4 provided at its lower and with a flat plate B adapted to receive the projectile. The lever 4 is mounted between a pair of uprights C and a spring D presses lever upward against a stop piece ring B is placed on the plate B and then dotted lines, and on being suddenly ic dotted lines, and on being suddenly is leased throws the ling to the lieg F. The lecesses above referred to ale indicated at G. It will be evident that consider-able skill is required to gage the exact height to which the harr 4 must be lifted, so that when released it will throw the ring to the desired racess andst in operating the projector the top crosspiece of the frame C projects at each crosspice of the trains C projects at each side, and provides a rest for the high side while the thumb is engaging the end of the lever A. The inventor of this game is Mr. Pierre V. Ericson, Cherokee Avenue, Hollis, Long Is'and N. Y.

In a recent number of the Zeitschrift Phys. Chem. T Syedberg describes some experiments on the limit of visibility of color produced by various substances in dilute solutions passing from coppor sul-phate in fuchsine and colloidal gold. It is shown that in the case of colloidal par-ticles the absorptive power is at first almost independent of the size, but pro-portional to the number, of the particles On reducing the size of the particles, how ever, their absorptive power becomes is and finally the ordinary condition of a transparent (true) solution is attained Syedborg argues that his experiments demonstrate the continuity of the colloid-al and crystalloid states, and therefore the corporeal existence of molecules



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NEW YORK, SATURDAY, JANUARY 8th, 1910

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### A REW PRA OF THE STRAW REGINE

F in the days of the perfected quadruple-expansion steam engine, anyone had ventured to criticise the type as being very inefficient as a means of extracting the heat energy of the steam that passed through it, he would have been considered as pleased through it, he would have been considered as hypercritical, to say the least And if he had wes-tured to predict that within a few years, by interpos-ing a certain device between the low-pressure cylin-der and the condenser, it would become possible to show an increased economy of from 25 to 35 per cent, and, in some cases, to increase the total horse-power output of an engine by from 70 to 100 per cent, he would have been regarded as a visionary. Yet it is a fact that this doubling of the capacity of an engine bas actually been accomplished, as stated in our editornal of December 18th, 1909, describing the remarkable

of December 18th, 1993, describing the remarkable work being done at the Pifty intil Street power station of the New York subray system. It is no exaggraction to state that the low pressure turbine has introduced an era of improvement in stemmengine practice which is destined to mark an advance in the art, greater than any recorded during mover, and we say this with full appreciation of the past estuarty of the history of this great point mover, and we say this with full appreciation of the control of the pressure conducting and the prounding and the later multiple-crystands neighbor continuing the pressure conducting engines of the time of Robert Pation, bollers were so weak and steam pressures so low that the cond-near was an absolutely

ares so low that the condenser was an absolutely sary accessory When Iron and steel plates benecessary accessory. When from and steel plates became available for boiler manufacture, there was a sponding rise in steam pressure, which led to a gradual abandonment of the condenser and a tendency to obtain the desired horse-power by working on the higher ranges of pressure. The high-pressure engine higher ranges of pressure. The high-pressure engine exhausting directly to the atmosphere was, of coirse, an extremely wasteful device, and the invention of the compound engine was logical and inevitable. Then followed the triple and quadruple engines, the limit of expansion being reached when the low-pressure cylinder became too large for practical purposes. If a cylinder were built that would carry the expansion of the stoam down to the full theoretical limit of reciprocal-lang-agine efficiency, its dimensions would be exag-gerated out of all proportion to the rest of the engine; the weight would be snormous, and the losses through frittion, and because of the great radiating surface. would be probibitive.

The steam turbine, on the other hand, is particu The steam turbine, on the other hand, is particularly adapted for accommodating the great expansion of the steam in the lower ranges of pressure, just as the reciprocating engine is better suited for developing the expansion in the higher ranges. The turbine losses in the higher ranges are largely due to the fric-tion of the rapidly revolving blades in the steam at its relatively high density whon under high pressure, whereas skin friction is not a serious factor during the expansion of steam in a high-pressure critical the latest pressure of the serious factor during the expansion of steam in a high-pressure critical factor to the serious factor and the serious factor and factor to the serious factor and factor to the serious factor and factor facto the lower pressures the steam has a small density, and the skin friction losses are incomiderable. Again, the great drop in temporature in a low-pressure cylin-der induces rapid condensation, and greatly reduces

the efficiency Hence, it will be seen that the reciprocating engine working on the higher ranges of pressure and the turbine working on the lower ranges are the comple-ments, the one of the other, and when acting in our

ments, the one of the other, and when acting in com-binating torm an ideally economical arrangement.

The range of application of the new system is wide, and alimsely the turbine is winning back for machi-ver's the approximate amount of heat which wide fortherly lost in the reversing rolling online at the steel works.

# Scientific America

in the winding singular of collaborate, and by the growth of the consect of winding righteries algorithms of the property has become opening to run in andition to the voting and the contract of the collaborate of the colla

### BAPID TRANSIT BY BRIT CONVEYER.

BY the action of the Board of Estimate of this city, which, on December 3rd last, passed a resolution authorising the Public Service Commission to lay out a morning platform subway in Thirty-fourth Street between Second and Ninth Avenue, there will be given an opportunity to test a system of transportation which we have always considered to be ideally adapted for relieving the crowded traffic conditions in congested centers of large

By far the most efficient means of moving n in bulk is the belt conveyer. For transp terial that is in a more or less finely divided nonei-tion, or made up of a large number of small separate tion, or mane up or a large number at small separate units, such material, for liestance, as grain, coal, or fron ere, the belt conveyor is recognized in the in-dustrial world as having no equal—provided, of course, that the distance to which the material is to be carried and the speed are not excessive

The moving platform is practically a continuous boil conveyer for the conveyance of a large number of passengars at moderate speed. It consists of abort lengths of platform, coupled together, forming an end-lengths of platform, coupled together, forming an end-length of platform, coupled together, forming an end-length of the platform of the platfo parallel rows of platform, the first adjoining the sta-tion platform, moving at three miles an hour, the next at six miles, the third at nine miles, while the fourth, which will be entirely covered from end to end with seats, will move continuously at twelve niles an bour Entrances to the moving-platform submilles an bour ranners to the moving-paratorn sur-way will be placed at every intersecting avenue or street, as the case may be The capacity will be 73,500 seated passengers per hour in one direction during the rush hour, as against 13,000 seated passengers on the eightear express train service and 7,500 on the five-

evanicar current service and injust on the mass against 25,000 standing and seated passengers per hour on the express service and 22,000 on the local services in a recent communication to the Public Berrice Commission by its chief engineer, Henry B Seeman, the advantages of the new system are stated to be. First, a vasily increased capacity and seats for all passengers, second, absence of the delay incurred by waiting for trains at stations since the train is always there and constantly moving third, the fact that pas sengers may board or leave the train at any point at will, and that instead of plating stations one-third of a mile spart, as on the present subway, they may be placed at every cross street, or indeed at any inter-mediate point. Furthermore, the subway construction may take the form of a continuous arcade, thus pro-viding an additional business front for display aid shouping purposes.

Although the moving platform speed of twelve m Although the moving platform speed of twelve mikes per hour may seem nomewhat show as combassed with the running speed of a subway truin, the difference is not nearly so great as might be supposed, and, indeed, over the shorter distances, is entirely in favor of the new system. The Commission's segimen shad itself for all distances of less than four miles the moving platform is a quicker and move convenient mode of platters is a quiteer and more convenient more or conveyance than the local trail service, or even quick-er than the local and express service combined, as passenger reaching Times Square Battots, From second Street, from any local station south of Fourteeth Street quicker by the moving platform than by the local and express trains of the present subway, The local frains ordinarily average, including atops, about fitted miles per hour, and twelve miles an hour during the rush of traffic If this rush hour service

acoust interes mission profes, and vessers subset as about a contract of the c

rrom es to et million, and the total expenses per tog-mile, even with the intersect on outpital coat of the electric installation reckneed in, have been reduced from 0.344 to 0.383 of a posity. On those branches of the North-Richtern Rallway that have been electrified, the train mileage has been

that have been electrined, the train mineage has eva-doubled, the platform capacity of the shain station at Newcastie has been increased, and the number of signal movements has been reduced by one-bill. These advantages, coupled with the higher rate of acceleration of the electric trains, have enabled these roads to carry, a trains that would have completely swimped

carry a trame tank would have completely swamped. It is of interest to note that in connection with the electrification of a branch of the Middand Railway, tests which are being made of the relative advantages of direct-current and single-phase operation seem to show that not only in the single phase taking care of the same service as the direct current. but that the show that not only is the single phage taking care of the same service as the direct current, but that the weight of the trains is only slightly greater, and the consumption of energy somewhat less. It is to be hoped that our New York Contral and New Hawn, and the alternating current, will make public, for jurposes of comparison upon a compon basis, the re-nalize of the past two years of electric operation. If these figures were given, together with the cost of stem operation of these same sections of road, the electrical world would be humished with a mass of dail of executional values and thisrance.

PRINCE AT THE LOS ABSELM AVIATION MERTINS.

PRIMER AT WELL DOS ARMENING AVEATURE MERITAGE
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age is all events. Scole for the makelike which gleates and previous records and makes flattest diverged of the course, \$6.00 for Insakility institutes and the course, \$6.00 for Insakility institutes record.

In the course of 

### ENGINEERING.

These has recently been launched at Bath, Me, the largest wooden vessel over built in the United States The "Wycoming," as she has been named, is a six masted schooner of 8,750 gross tons, with a total length over all of 250 fast. Next to her in size among wooden vessels is the "William L. Douglas" with a gross ton near of 8.756.

nage of p.700.
The lemesh of the battleship 'Ulah at the yards of
the New York Ship Building Company Canaden, N J
signallises, for the time being, the possession by the
United States navy of the largest battleship afont
but this halp and the Florida now being build at
the Brocklyn any yard are of 31836 tons displacement, and each will carry four 11 to the pure

ment, and each will carry ten 13 inch guns a Twuward the close of last year the four mile tunnel through the Andes on the line of the new transandine railway between Chill and Arganine was broken through The tunnel lies on the Chillian side of the boundary line between the two countries and comte summit of a new single-track road 1 is acquetted that the tunnel will be completed and the whole line opened in the spring of the present year

What annual sport to the Secretary of War Gen Murray Chief of the Costs Artillery amoneous that the difficult problem of mining the waters of the ness at the esserts entirone to Long Island Sound has at last been solved By using anchors of 100 pounds weight mines we asconsertily archored at the great depth of 100 cet. A complete submarine equipment for the race' will soon have been put in

The British Coaps section of the Caps-to-Cuiro Rail way 148 nulse in length was formally opened no comber 18th it extends from the Chartered Com panys termines at British Hill to the southern from the other Caps and the Caps of the Caps of the continuous British line of 31 if nulse north from Cap Town Work is in progress on an additional 160 miles which will probably be completed in the saturant of

The "Vanguard" of the British nary which has now undergone her trials with a maximum high power undergone for trials with a maximum high power may be a subject to the British and the subject to the British and the subject to the completed for the British her has displacement in 19.200 tons 8th certries ten 12 inch gas displacement in 19.200 tons 8th certres ten 12 inch gas displacement in 19.200 tons of the order to the and two on other broadside of the section with the subject to the subject tof

The United States Engineer Corps are engaged in surveying the route of the proposed Atlantic Const Canal from Beston Heas to Ray West Fis. The scheme calls for a canal from Beston to the coast through Long Island Sound to and across New Yest Ray these across New Yests to the Delawars River thance to Norfolk on Chemapsake Bay and theace to the sounds of North Carollina and Beaufort Intel. The law providing for this survey calls for surveys for a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and a 15-foot ship canal from Beston to Beaufort and canal from Beston Gentleman Schotzer and Sc

To incolliste traffic across the huge Cubelre cut and corresponding the across the huge Cubelre cut as part of the corresponding to the cut and the cut as a constant of the material scene the cut at Bingire Most of the material cut the bridge was found on band at Panama. The tiffening trass was made up of 4 x 8 and 6 x 6 timber and the towers were built up of 4 x 1 and 6 x 6 timber and the towers were built up of 4 x 1 and 6 x 6 timber and the towers were built up of 4 x 1 and 7 x 10 eroscotic plate timber built up in 1 and 7 x 10 eroscotic plate timber built up in 1 and 7 x 10 eroscotic plate timber built up in 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up in 1 1 and 7 x 10 eroscotic plate timber built up 1 1 and 7 x 10 eroscotic plate timber built up 1 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic plate timber built up 1 and 7 x 10 eroscotic pla

The sunagement of several rallroads have followed the head of Janes J Illii in impressing upon the farm ers the need for conservation of the fertility of the soil and titey are using for this purpose the demon stration train One of the latest of these equipped by the Prempyrismi State College is being open to the prempyrismi State College is being open instruction ours are following a route through coninstruction ours are following a route through conmant Nobrands. The return to the railroads for the outlay for this enterprise will consist in the increased smount of reight brought to their these as the result of more intuiting than the contraction of the contraction

The harcedesizes of the articulated compound type his name results for the nutliceal to greatly to create the discovery production of the nutliceal to greatly to create the discovery compound of cartering locomortive which have become unequal to the work demanded to the Works have secondly of the nutliceal to complete the states for the nutliceal form of the nutliceal form o

### ELECTRICITY.

The Mobel price for physics has been divided this year, one-half being given to Gugileimo Marconi for his development of wireless telegraphy and the other half to Prof F K Braun of Strasburg University Germany, for his work in radio-activity

Segmentary for an event a factor of the segment of

value ... The scout cruisers 'Birmingham' and Salem were sent recently on a cruise is test the efficiency of their wireless tolegary hysics and that of the state of Braat Rock Mass. The cruisers were to attrapt to ministal communication with such other over a distance of a thousand miles and with the land station of a thousand miles and with the land station of a thousand miles and with the land station of a thousand miles and with the land station of the land state of the la

A new steam-electric locomotive is being built in England II comprises a steam turbles which operates a dyname supplying current for four series wound motors. The engine is being designed to have press trains and will be tested in actual service so as to show its efficiency as compared with the ordinary steam locomotive. It is pointed out that turbo gar entors have proved so efficient in sationary plants that a similar system would very probably prove to be of vision on relatively to replace steam locomotive.

A writer in Singineering (London) calls attention.

A writer in Singineering (London) calls attention.

A company is now being formed to exploit these power resources. The Singingan (New Pails comprise the Goda Pails with 39 200 horse power the Aidoylar Pails with 39 200 horse power the 100 horse power. The Lazas River Pails would produce 2000 horse power the Sing Pails 5000 horse power than 2000 horse power than 2000 horse power and the Guidfone Pails 100 000 horse power with all this brivation power as the Singingan Pails with the Singingan Pails of the Singingan Singingan (Singingan Pails Singingan Singing

A press report from England speaks of a remark shell development in wireless telephony whith will make it possible within a few weeks to carry on convertation between Paris and New York. As the reord difficance over which wireless telephonic conversa
in has been had even under the most favorable conditions in but a hundred unite or so it is impossible to be a hundred unite or so it is impossible to be a first and the second through the second telephone or great a distance and as the developments in wireless telephony are in their infrancy and
far short of those in wireless telephony are in their infrancy and
far short of those in wireless telephony are in their probable
that we will have to wait many years before conversa
tion can actually be maintained between the cities

A saw type of car has been built for a line in Brime with Ga in which the conductor is eliminated. The cars are of the pay as you-enter type but may be esterted only from the front platform where the fare is deposited in the cash box under the motormans eye. The cash box is provided with a giass receive in which the fares may be examined before being dropped from the titting bottom into a locked cash drawer. The cash box must be moved to the other platform when the car is on its return trip and this has made it necessary to provide certain presentions to prevent coins from dropping out in case the box to prevent coins from dropping out in case the box to prevent coins from dropping out in case the box when the box is removed from the support. The box is also provided with a fave-counting machine

An interesting comparison of the New York and Paris subvery systems was published in a recent number of the Biestrio Ballway Journal. The following conclusions were reached in the Paris system to exceed the substance of the sub

### SCIENCE

Former President Rosevolts African hunting trip with result in enlarging the Smithsonian collection by 6 683 skins The collection consists of hides of 243 large mammais 1500 small mammais and 1376 stuffed birds Human skulls picked up along the line of the sarient slave trail are also included

Prof. Hespassell, Count von Zeppelins math.matical and meteorological advisor in new in New York He states that two airships will be used by Count von Zeppelin with a view to exploring the entire region within the Arrice Circle One will probably be at a relief station in Spitzbergen while the other is on its journeys the two keying in touch by means of wireless telegraphy. The German government will undoubtedly aid the understaining financially

Observed, symphile and diagonds are only different forms of one chemical clement arbon. Hitherto carbon has been regarded as introduced by the particular to the particular to

Dr. W von Osobalbassuser has invested a method as of converting ordinary coal gas into a very light as which it central the control of the converting ordinary coal gas which it central the control of the betay hydro callons and reasoning all of the heather process consists in decomposing and removing all of the heather control of the control of the

A bitten about six months old was taken to a house a few miles distant from its birthplace con bade in a room and tenderly cared for during a week and them set at liberty it was supposed to have become habituated to its new surroundings but ittuned to its old home on the day of its release. The sense of locality and direction was outbirded still more strikingly yes nod tom cat which was stoice and extribing the set of the second of the second of the cat was imprisoned but made its even; and in a few days respaced fia a pitilable size at the home of its former master which was separated from that of the third by a high wooded sill?

A writer in Kommo states that h, possesses a rame magple to which be spotifively offered an entinguished cagar stomp. The bird began to tast the stump agard to anopared to antibo stump. The bird began to tast the stump agard to anopared to antibo stump the stump agard to the stump agard to the stump the stump agard to the stump agard to the stump agard and methodical manner. The experiment was subsequently repeated many times always with the same result. The magple is no fond of tobacco that the sreparately another de lighted cigar from his hand against his will it also picks up failer eight and the stump and t

A great number of elements was studied by Madams Carrie but with the exceptions of radium uranium and thorium she found no elementary abustance peased of a radioactivity greater than one one seased of a radioactivity greater than one one seased of a radioactivity greater than one one threater of the radioactivity of the results of a great many substances. Their experiments confirm Campbell is results to regard to the radio activity of potassium and rubidium. This radioactivity however is very small being in the case of potassium only 1/1000 of the activity of the fradiation of uranium ordied. In this case the results of the results of the case of potassium only 1/1000 of the activity of the fradiation of uranium ordied. In this case the results of the results o

## A UNIVERSAL VISE.

BY JACQUES BOYER.

Visce usually occupy fixed positions and serve merely as clamps by which the wood or other material is prevented from moving while the workman is com pelled to adapt the position of his tools and his body to circumstances as best he may The ordinary vise no matter what the purpose for which it is designed consists of two jaws one fixed the other movable. The latter is moved toward and away from the forms

the factor is moved to wat do not not not not not not not not in the fixed law and in a col lar in the movable law and the movem at its opposed by a flat spring which takes up the lost mo-

The universal vise invented by P Glong on is mounted on a ball and socket joint which allows it and the object held by it to be turned in a y dir tion so that the work an be done more conven-iently and in a favorable light iontly and in a lavorage light.
When the vise has been set in the
destr d position the ball and so ket
joint is locked and held motionless
by a do bie joi ed jaw opera ed
by a strai termina ing in a loop in whi b h workman's foot is placed

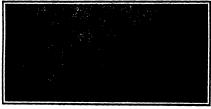
As he accompanying photograph indicates the niversal vise is de signed primarily for the use of shoen akers It can be employed with advantage in shaping sewing nating and aim

e ery other operation involved in the making and re pairing of shoes The shoe and the standard which carries it can be turned into any position and instantly bilized without touching the screw of the vise so that shaping can be done mu h better than is possi ble with a rotating vertical standard as the sole and the heel can be placed in the positions most favorable

The apparat s is very simple and comprises only five large parts and two pins.

The Pacific coast I mber man facturers have taken the initiative in an important step for the promotion of

proper and conservative use of their timber supply Practically all of the large manufacturers of lumber in the States of Oregon and Washington have entered into the States of Oregon and Washington have entered byte an agreement to manufacture odd as well as evan lengths in Scoring Snish and similar planing-mill products. Heretofore it has been customary to mass facture these products in oven lengths only Now it is proposed to trim the manufactured lumber to of odd numbers as well as even numbers of feet sed to trim the manufactured lumber to be



THE UNIVERSAL VIOL

the old system a considerable portion of the lumber which came to the shaping machine was wasted and this action has been taken in order to save that waste this action has been taken in order to mare that wasts Considerable opposition to this innovation has arisen among retailers and consumers. The retailer contends that it is impossible for him to dispose of odd length material because of the common practice in the con-struction of wooden buildings claiming that the initial saving of the manufacturer is transferred to the con sumer This is denied however because of the pro-portionally small amount of odd length material which portionally small amount of odd length material which will occur under the new system and because of the latter day practice of laying sub-floors of rough lumber and sheathing on the sides of the house before putting the finishing material in piace. Becomes of servation element which enters into this que United States Forest Service has been recomthe adoption of odd lengths for some time past. The Portland office of the Service has recently made an investigation of the actual amount of unprecentry waste incident to the manufacture of even jungths only wants incident to the manufacture of even jumpins only and these figures show that under the del system the refuse burner consumed about two per cent of the total amount of the important forms of planing-mill products which are manufactured from Douglas fir and

manuscured from Desgias in and other important forest species in the States of Gregon and Washing-ton When it is countdered that about 750 000 000 feet of planing mill products are manufactured a nually in the two States mentions nually in the two States mentioned above this two per cent assumes important proportions. The Forest Berrice is authority for the statement that 15 000 000 board feet of high-pric 1 unnber can be saved annually o Oregon and Washing ton by the meanifacture of planing-mill products into lengths of odd feet as well as even It would require the yearly growth of timber on approximately 20 000 acres of average timber land to produce the

amount of lumber which this an nual waste represents The manufacturer is convinced that the waste is unnecessary. His greatest trouble now lies with a similar conviction on the part of the consumer that odd lengths can be used as economically na even lengths

The new Mexican Pan American Tailway has already been opened states the American Machinist and the line is in active operation from San Jeronimo as the Tubuantupec Railway to Tapachula in Chiapan. The estimation of that line will be continued to Post San Sentic on the Pacific coast There is also planned a new rallway peasing through parts of the States of Coabulla and Chinahua, about 275 miles long

## MECHANICAL BOWLING MACHINE.

## BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

Numero s efforts have been made from time to time to device a n echanical apparatus for reproducing hu man action in the dolivery of a bail in various games here such is required su h as baseball cricket ten nis and so forth The problem however is somewhat nis and so forth amuch as in bowling success is largely de pendent upon the brains of the bowler who resorts to varying subterfuges to nonplus his opponent such as varying the pace swerve and break of the ball while in the air or after it has struck the ground To repromake arror area it has struct to ground to repro-duce those peculiari tes by mechanical affort is no easy matter but an English engineer Mr D D Fuson MIME of Bir

minghan has perfected an ingeni

As may be seen the apparatus comprises a tripod of steel tubing firmly fixed to the ground by means of specially designed anchors which correspond to the body of the bowler. The ball rests freely in a semistherical cup or hand carried at the outer end of a lever about the length of the human arm with which it corresponds the low r end of this lever being piv oted to the body at the shoul

When the machine is at rest the When the machine is at rest the arm rea aims in a vertical position and the bowling operation is preduced by pressing this arm back ward into a northeattal position with the ball resting in the cupshaped hand. Directly the arm is released it files toward its normal position describing therein a quarter of a circle the ball being propelled through the air with varying velocity as desired toward its objecthe This forward movement of the moving arm is produced by the

action of a strong spiral spring one end of which is attached to the moving lever a short distance above the shoulder while the other end is situated to the body by an adjustable tightening server by means of this serve the momentum imparted to the arm and consequently the velocity of the ball can be regulated nearly by situating the tension of the spiral spring.

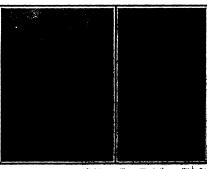
A ball silvered the standard body of the spiral spring.

A ball silvered the standard body of the spiral spring.

The standard body of the spiral spring.

A ball silvered the standard body of the spiral spring.

A ball silvered the standard body of the spiral spring of th



The purchise in the not of historials the hell-Inserting the ball in the "hand" of the

A MINIMANINAL POWERS MANIEUR.

left when coming into contact with the ground and which is so leafling to the bateman. This requirement is ridillised in an inequatous manner. The center of the cup-shaped recognization or paim of the mechanical hand has rolles or draw with its act in canning transversely with the bottom of the cup and having its pertplays; with the bottom of the cup and having its pertplays; with the bottom of the cup and having its pertplays; which the bottom of the cup and the contract of the painting of the cup and the contract of the cup and the draw. The cup itself is fixed into a bondhaped centure at each drawnation is that the external diameter casting of such dimensions that the external diameter of the cup will fit against the four internal sides of

its containing box. Attached to the base of this outer box and at right angles therewith is a hollow spin die or tube mounted on a bearing which is rigid with the end of the die or tube mounted on a basering within it reight with the und of within it of case for reviewd. It will be observed, however, and the whole it can be reviewd. The will be observed, however, and the will be observed by the within the box and cup are mounted the within the box and cup are mounted the place of the will be being and at right angles with the boilt englands being being and a right angles with the boilt englands the will be being and at right angles with the boilt englands to will be an a groom or which peace as a land the seeks or which peace as a land the seeks of which held dever a recess in the arm to willing he at the seek of the seeks of the legisle of the property of the peace of the legisle of the property of the peace of the pea

# Japanar & 1910

# AN AUTOMATIC RAILWAY SAFETY STOP.

### BY DR ALFRED GRADENWITZ

Sings the terrible catastrophs on the Berlin Ele-toted and Underground Rallway caused by a train remains by a stopping signal, the German rallway administrations have been giving increased attention to automatic braking devices for pre-

or the recurre the recurrence of such acci-The apparatus illustrated in the dents. The apparetts libertrated in the secompanying figures has been adopt-ed provisionally, and is now being tested set. Its object is to warn the engineer; and framan by visible and sound signals and set the brakes, all be-ing done simultaneously. The safety device consists of contact

mounted on the locomotive, and levers mounted on the locomotive, and pedal contacts arranged on the track. The former are always arranged on the right-hand side of the engine, and are right-hand side of the engine, and are actusted by a permanently tightened spiral spring. In the interfer of the one is arranged in a complement point in the contract of the contract of the contract of for indicating to the driver (1) whether the track in disappanel, (2) which signal has been passed over, or (3) that the supersitus is out of order, the various indications being signaled on the various indications being signaled on the being own in the contraction of the property of the contraction of the con-traction of the con-trac

frame, immediately before the engineer's syst.

Above this repeating box is arranged a recording box, which mainly contains a clockwork, which is actuated if the train runs by some signal. The clockwork sets a relier and paper tape retaining and thus causes a dash or dot to be inserbed. Furthermore, the engine paper tape, before passing the signal on paper tape, before passing the signal on have been duly attended to These marks may serve as useful records in the case of its westle. the case of law-suits.

the case of law-mits.

The the roof of the driver's stand is mounted an slarm stren, the howing sound of which is readily distinguished from that of ordinary locomotive whisties. The same siren is used as a braking signal in the case of brakeless.

ods trains. On the On the run otive ning board of the locometive is arranged the brake-cock coming 5, containing, in addi-tion to the brake-cock, a click for tightening the spring above mentioned, and, accordingly, the whole apparatus. eliek in turn, is eon cted through the draw-bar 10 with the contact levers 6. These two contact levers 6 on sliding over the contacts ull downward the draw-bar ed thus set the apparatus

actuated only in the event of both levers being struck simultaneously. This arrangement thus insures thor-ough reliability of operation At each distant signal there is arranged a single

Tripping devices in operation.

10

ent of track and engine contacts, warning devices in eab

pair of track contacts, and at the main signal, two
pairs, situated about 30 meters apart. They are so
connected with the signals as to be lifted when the
signal is closed, thus protruding beyond the rail head
and coming into contact with the sild

ing levers of the locomotive, whereas in the event of the signal being drawn, they are located below the rail head, so as to avoid any contact. In addition to these stationary ped-

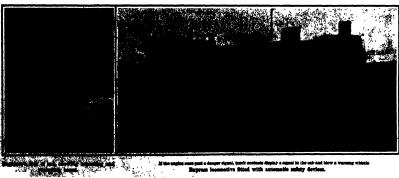
als movable pedals are provided which are readily fitted behind fish plates, with a view to warn and stop trains at any point of the track

The working of the apparatus is as follows On the contact levers passing over the track contacts, the draw bar 10 is pulled down, thus disengaging the click. The ameratus is merely overated by the spiral spring, and as the contact levers perform no work outside of disongaging the tightening apparat-us, any heavy shocks are prevented, and the wear and tear is reduced consider ably

On passing over a distant signal, the contact levers strike only a single pair contact levers arrise only a single pair of podals situated on the track, thus closing an electric circuit, by the action of which the alarm siren is sounded, while a disk bearing the in scription "distant signal" yppears in the cab signal box and a dash is mark ed on the paper tape in the repeating box. The brake cock is opened at the same time and the train is stopped automatically Owing to the automatic disengagement of the brakes, the driver is in a position himself to throw the an paratus out of gear, and to continue

his journey
On a closed main signal being pas over, the contact with the first pair of pedals produces an effect, as above stated, during a very short time which immediately by the second pair of track contacts. In fact, second pair of track contacts in fact, this second contact further disengages the click, thus opening completely the braking cock and producing a rapid braking. At the re-

peating box appears a disk with the inscription "main signal," while at the same signal," while at the same time a dot is marked in the recording box In addition to this, a checking lead is broken. The second contact also causes the apparatus to become locked up, so that the engine driver is no longer in a position himself to throw the apparatus out of gear, be-fore the train guard has re-(Continued on page 3A.)



me past a danger signal, track contests display a signal in the cab and blow a warning whichis Ngayean locomotiva Attad with automatic sufety devices.

## FRICTION

# AT RAILWAY CURVES.

BY J. F. SPRINGER

When two material surfaces are in contact with each other, there are two distinct methods of with drawing points of contact from each other Consider such points to be extremely small plane areas. Thus, let Fig 1 represent a highly magnified sectional view of two contacting points AB represents the infinitesimal plane area (First) The surfaces may be with drawn from each other by moving C or D (or both simultaneously) in a direction perpendicular to the plane represented by AB. This gives rise to what is termed rolling friction (Second) Withdrawal may be effected by moving C or D (or both simultaneously) in any one of the directions lying in the plane rep sented by AB. Thus, the inovement may be along AB. The direction is immaterial, provided it is in the tiny plant of contact. This method of withdrawal gives rise to sliding friction

Now material surfaces are not perfectly smooth When in contact under pressure, the projecting parti-cles interlock with each other—as idealised in Fig 2 it can readily be seen that movement in the directions (1) H would tend to shear off the large projections 1, 2, 3, 4, while movement in the directions B, F would tend to shear off merely the interlocking prot tend to shear off merely the interiorking protuberances of the large projections. That is to say, idling fric-tion involves abrasion of the principal projections, while rolling friction relates merely to projections on projections. Consequently, it is not difficult to com-prehend that aliding and rolling frictions belong to different orders of magnitude. In fact, the one kind of friction is a most important consideration in me-chanical engineering, while the other is usually negli-

It is easily seen that the movement along AH produces what we all understand by sliding friction, but perhaps some may healtate at considering perpendicu lar withdrawal as rolling friction Consider Fig 3 lar withdrawal as rolling friction Consider Fig 3 Here the wheel is rolled in the direction given by the arrow C The removal of the points contacting at A is effected by the change of the instantaneous center of rotation from Ad' to the next point BP [See article "Bome Principles of Bail Bearing Design" in Scirn pounter remembers of nationaring transfa. In Bell's frite Assistant for November 6th, 1993 In making this change, A moves perpendicularly away from A' Likewise B approaches B' perpendicularly and as on throughout the roll—the points of contact ap-proach and recede from each other perpendicularly to the surfaces of contact

Now it will not be very hard to see that any move-ment of withdrawal that is oblique is really a compound of the perpendicular and parallel movements. We may provisionally assume that in so far as it is perpendicular it is a rolling friction, and that in so far as it is parallel it is a sliding one That there are such compound frictions may be seen by consulting the article to which reference has already been made.

the article to which reference has already been made. Now two very important commoning questions arise in connection with frittion. First, friction severs the contacting parts. This is a matter of very consider-able significances. Sevend, friction consume power in performing this abrasion in some cases, this becomes a matter of still greater importance. Some case, the becomes a matter of still greater importance where, they go had in hand—sub-less setteration of material and the still are still and the still are the still are the contact of the still are waste of the power used in accomplishing this destruct

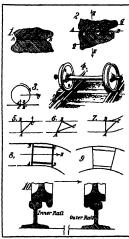
These two factors have, perhaps, been m These two factors have, perhaps, been more or loss recognized almost from the beginning of the age of machinery But it is only in comparatively recent years that their vital importance has begun to come to the fore. In every direction in the machine world this is testified to at the present time by the intro-duction of ball and roller bearings. These serve—with more or less perfection—to accomplish the exchange of more or less perfection—to accomplish the excange of silding for rolling friction. In the railway world, the antifriction movement is attested by the fact that large outlays are being made to eliminate the friction at curves. Reduction of time is no doubt also in view. But the railroads cortainly have in view the economic gain to be derived from the avoidance of that excee sive wear on rail and wheel which occurs when rous ing a curve, and the money advantage in saving the steam power wasted in effecting the wear and tear

steam pure wanter in miscring the vote not were arrived. That railway curves give rise to a very excessive amount of friction may be understood from the amount of war occurring at a certain curve in the "subway" of the Boston Elevated Railway Carbon-steel rails were replaced at a certain point, on the average, every forty four days. The amount of wearing down on the heads of these rails was about three-quarters of an needs of these raiss was about three-quarters of an inch. As to what happened to the wheels in accom-plishing this wear, no one has any exact information. But it must have been very considerable. Three-quar-ters of an inch was not worn off the rail head with-out a corresponding effect on the wheels and fraciss. What happened at this curre is happening, in

greater or less degree, upon all curves, wherever located. It is a matter of interest and importance, then, to consider more particularly the causes of friction at railway curve

Three prominent factors enter The first causal factor arises out of two facts. The outer rail of a curved track is longer than the inner one. And yet the one must be covered in the same time as the oth els and axles are so combined that two wh and the corresponding axie operate as a single piece. Consequently, the one wheel is compelled to rotate at precisely the same speed as the other. In rounding a curve, however, a greater distance is covered by the This conflict of rotational velocities between the two wheels results in slippage, and this of course means wear of metal and loss of power it is to be observed that this friction occurs irrespective of the speed of the train. For the difference in length of rall between the two sides of the track remains precisely the same, and this controls the amount of slip-page. The seriousness of the friction is accentuated,

page The seriousness of the friction is accentuated, however, by the speed it has been proposed so to arrange the wheels and atle that this slippage could not occur. This might be done in two ways. Both wheels might be rotatably be done in two ways. mounted, the axle being kept "dead"; or, the one



PRIOTION AT RAILWAY CURVES.

wheel might be made integral with the axle, and the other rotatably mounted That either method would be effective can scarcely be doubted, but practical railroad people do not seem to take kindly to wheels mounted rotatebly on an axia

mounted rotatably on an axis.

Whether they are justified or not, there is another friction factor which enters and which is of the greater weight. In order to get this clearly before the mind it will be well, perhaps, to consider the action of a group of fanged wheals on a rulway track. Suppose we take a single pair of wheals and the corresponding we take a single pair of wheals and the corresponding we have a single pair of wheals and the orresponding the single pair of wheals and the such wast be kept perpendicular to the direction of the size which is the case of the sizes pair of wheels, how Fig. 4. Now it will readily be created that the axis must be kept perpendicular to the direction of the ratio. In the case of the single pair of wheels, how will this be maintained? The two planes of the finance as the places of contact with the hadde of the shead of the rule in decket give some assistance. But this is practically negligible for the reason that a turinance would be competed, be destroy the perpendicularity of the main, see "or fine, a very allert disturbance would be competed, to destroy the perpendicularity of the main, see" and a carciality track. Consequently, some additional mission think be withined if we attempt to solve this problem by obstructing a truck of fiftee wheels; all being maintained maintained in their exhistive possition to easie other, we should not supposed. In Fig. 5, the triangle &BC we about the contraction of the relative position to easie other, we should not supposed.

represents such an arrangement, the wheel contacts being supposed to be at the vertices A,B, and C. This track would no doubt withstand any tendency operattreat would also could written and a tensestry operating to throw it in the direction of the arrow at C. But a tendency in the opposite direction would give rise to the situation in Fig. 8. If at no other time, such a tendency would arise at a curve in the track when the rail corresponding to BC tended away from the truck as a whole This condition of affairs is

rapresented in Fig. 7
The lowest number of wheels which when combin in a truck are competent to maintain themselves upor a track is four. The four-wheeled truck is come quently the unit that must be dealt with in consider ing the friction arising at curves.

Now when such a truck rounds a curve, the c Now when such a truck rounds a curve, the outse wheel of the forward and is the one which first mosts the change of direction. This is shown in Fig. 8, where the wheel at  $\theta$  has beguin to respond to the our-aures. The wheel at  $\theta$ , because the rail curves away from it, will tend to be relieved. The impotes of the truck is in the direction B. Consequently, there is a server grind at  $\Omega$ . And this condition obtains through-server grind at  $\Omega$ . And this condition obtains throughout the curve

No doubt if, during the time of rounding the ou the axies of the truck could always lie in radii of the curve, as shown in Fig 9, the friction arising from the rigidity of the truck formation would be largereduced, if not entirely eliminated. Inventors se ing to attack this problem must remember that the ar-rangement of the truck cannot be fiexible. The change from the rectangular form to that of the isosceles from the rectangular form to that or the monotone trapesoid must be sufficiently instantaneous. It must not go further than requirements demand. Further, conditions must be reversible for curves bending in the opposite direction Altogether, this is a very

her factor which enters is one neinted out he Another factor which enters is one pointed out by Mr. Edward Godfray. The track of the wheel is not horizontal, but inclined, as in Fig. 10. On the outside wheel of the forward sade the climbing tendency re-sulting from the effort of the truck to more if a stright lite forces the wheel flamps to some such pea-tion as that shown in the figure This saided, so doubl, by the fact that they greater speed is stillined doubl, by the fact that they greater speed is stillined Reverse conditions on the inner side of the curve cooperate to the slewing of the whole axis outward, be-cause thus a less speed is obtained on the inner side of the truck. Now the result of this slewing is to bring a very steep portion of the outer wheel in contact with the head of the rail. There arises, thus, a severe wedge action This is, perhaps, the most important of all the factors giving rise to friction at curves. It is due to a combination of the causes proscing the other two.

### ath of William A. Hide.

William A Eddy, well known throughout the country for his many kite-flying experiments, died recently after an illiness of several months. Mr Eddy's life was spent in the study of kite flying, to which art he contributed much that is valuable. Although a self-taught man, he did much useful work, particularly in kite photography Latterly he was very much inter-ested in aeronautics, to which his kite investigations

Dr. Czerkis of Vienna, who has undertaken a study of the chemical structure of cannabinol, the active principle of hashish or Indian hemp, gives the following graphic description of the peculiar intoxication which hashish produces. "It is as if the sun filuminated every thought that passes through the and every bodily movement is a source of joy es through the brain The hashish eater does not experience the kind of pleasure which is produced by the gratification of bodily spannames sure cross in the appreciance test state of passages which is protected by the granification of bodily applicate. Its feels the jet of one who hears good newton of the miser committy his gold, or the broken passages of the miser committy his gold, or the broken passages of the protection of the state of the surpress of the through the cross state of the committee of the surpress and the crystale passages are judgmen and these, without the committee of the surpress of

THE STREE OF AN ARMOVALES PROFILERS.

The street of the street of the street of the street of an appreau train by means of a fan assess absert on the face of it. One is agit to discount the power of a fan Aris such an intangible, impressionals, substancioses Suid, that it seems innecessible to detail sendent and the street of the street possible to obtain sufficient thrust against it to drive a machine of any appreciable weight. Yet this is what a fixing machine propeller must do. The result is obtained by making the propeller of such airs and driving it at such speed that when the machine is held stationary, the propeller will generate a current of art forwing at the rate of a hurricane. We know something about this power of heavy galler, and when we consider that an arroyalm propeller in capable of producing a moderate-sleed cyclone, it is easier to conceive or its exercing numbers in the continuous contract of the secretage numbers in the secretage numbers in the secretage numbers in the contract of the secretage numbers in the ttained a speed of over fifty miles per hour. In order to do this, the propellers must have been driven fast enough to have produced a current of air considerably more than this velocity, because the fluidity and elastic of the air is sufficie nt to cause a conside tiy of the air is sufficient to cause a considerable "silly" of the propellers, which reduces their efficiency to a large extent, depending upon the design of the pro-peller. Our frombeage illustration this week shows Mr. Rübert Latham's "Antoinstic" monophane under goding a test of its propeller. The propeller is revolv-ing at the rate of about 1,100 revolution per minute, which is about the rate of the average electric fam., but when we consider that the propoller describes a circle 6% feet in diameter, some idea of the volume of air set in motion by the machine can be conceived At a test made in England last fall, a thrust of 265 At a test made in England last fall, a threat of 36 prounds was obtained Supposing the motor to develop only 30 horse-power instead of the 50 at which of the 1st parties, this is equivalent to but 8.5 pounds per horse-power, which is about all the average propalier between the second of the 1st parties and 1st partie the rapidly rotating propeller is cut at two points by wide dark bands. These are shadows cast on the blades The shadows are, of course, intermittent, as they full upon the blades only as they come within the range of the shadows This suggests an experithe range of the sandows This suggests an experi-ment which was submitted to us some time ago by one of the readers of the SCHWILFIC AMERICAN He proposed to show the shadow of a man on a string The proposition appeared rather startling, but he soon strated that the complete shadow, showing a perfect profile of the man's face, could be shown on the string, provided the string were weighted at one end and whirled around so that it formed a hazy patch of reflected light similar to that produced by the paces of reneced ight summer to that produces by the perpaintenes of vision of course accounts for the haze in the first place and for the shadow as well, because both are intermittent, as an instantaneous photograph

The Fublic Seath System of New York City.
In a paper presented before Section 1 of the American Association for the Advancement of Science, at the Section meeting, Documber Sith, 1999, suttled "The Public Sath System of New York City," by William H. Hale, Ph D. Superintendent of Public Saths of Section 1999, and the Section Section Section 1999, and the Public Saths of Section 1999, and the Public Saths of the Section 1999, and the Public Saths of the Section 1999, and the Sectio

Prior to the consolidation of the surrounding cities Prior to the consolidation of the surrounding cities into Greater New York there was no interior public bath. All were located along the river front as floating baths. The first interior public bath in Manhattan borough was established on Rivington Street on the cast side of the city March 23rd, 1901, and has been the most crowded of any bath, on the average, for the

Newer baths opened on Pitkin and Montrose Ave-ues, Brooklyn borough, have had more bathers in hot uses, Brooklyn boringh, have hed more suthern in hot weather than any others. It is stated that on one hot extensed day 9,000 bathers used them. A third public substitution of the property of the 10 to 10

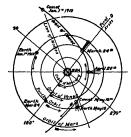
nat. In Modeltin, it signall charge of thicks, it could for the group that I count for a count, signal and middless falling of span that I count for the same of a can basis. The first late is the basis, when the same of the can be considered to the can be considered to the can be considered.

later bath houses swimming pools have been built sixty feet long by thirty-nine feet wide, said to be the largest in the city Newer bath houses have a gymnasium built in the second story above the bath This has been found to be a most use Mr Hale suggested still further that root gardens be built above the gymnasium He also recommended that there should be a greater extension of facilities for public bathing, particularly the establishment of a great public bath by the sea modeled after the baths at Revere Beach and Manhaset Beach in Massachusetts. At Coney Island on city property such public bath structures could be constructed as would be rative to the city and yet would supply a preblic want. Mr Hale further recomm ads the es and plants which in "sate buttom to routificiate the east adultable of a separate bureau of public baths and gymnasiums, with bullorm pay to attendants and officers, it cover the whole city. The city should have full control of the proposed seasife baths, as they are inceaded for the entire city and not wholly for the borough in which they are located

### RELATIVE POSITIONS OF MALLEY'S COMET. THE BARTH, AND THE SUN

At the top of the accompanying drawing the com-At the top of the accompanying drawing the comet is shown in its position for January 1st, 1910, outside of the orbit of Mars. At the left the earth is moving in its orbit away from the comet, the distance between

them being about 115 million miles
On March 34th the earth will reach the position
shown in the drawing, while the comet will have
moved to a point on the opposite side of the sun
During this period (January 1st to March 24th) the comet will be visible, with the telescope, in the western evening sky, but on March 24th, when passing back



RELATIVE POSITIONS OF HALLEY'S COMET, THE BARTH AND THE SUN.

of the sun, will be invisible for several days. The between the earth and comet at this time

will be 165,000,000 miles

n the comet next emerges from the rays of the sun it will have shifted to the morning sky, rising before dawn, and for the first time becoming an interesting object to the naked-eye observer. The earti met will now rapidly approach each other and the latter will greatly increase in brilliancy

About April 20th it will pass its nearest point to the sun, as shown in the drawing, and on May 18th will again disappear in the sun's rays-this time, however, ssing in the front of the great luminary dicted that the nuclous will cross the sun's disk about five minutes of a degree from its center, thus furnishing an opportunity to observe whether the nucleus is saque to the sun's rays. The transit will not be visible in the United States

s it will occur after sunset here
On the night of May 18th the sarth and comet will On the night of May 18th the sarth and comet will rush past each other and the earth will probably sweep through the tail of the comet. They will be only 12, 000,000 miles spart. After May 18th the comet will attain its maximum of splendor in the avening sky, and in a few days thereafter its glory will rapidly fade.

### ------

The Cerront Supplement,
Dr Airred Gradenvit opens the current Strrrisers, No 1775, with an article on a more plow enployed on a five railway. Some interesting information on unbrackers write exhaustively on friction
from an article of the chaustively on friction
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navigation is the provision of suitable places of refuge for the enormous dirigible balloons of which Germany is the proud possessor. The problem is discussed in a copiously illustrated article by our German aero a conjugati illustrated service by our teerman agro-nautic correspondent. Dr. Robert Amory writes on coffee as a beverage and describes a new method of preparing it for the table. The great guano deposits of Poru are described and illustrated. Dr. L. H Back-land summarizes the electrical and electrochemical applications of bakelite

### Correspondence.

### THE RED OF THE "DANIEL TREET"

To the Editor of the Superira America Terrary

To the Editor of the Superira America as

In looking over some old files of the Superira

America v. to-day, I found in the issue of March 13th,
1897, reference of the building of the old merchant
ship "Daniel I Tenney," built at Newburyport, Mass, by John J Courter, Jr

ection with the storm now This item, in co-This item, in connection with the storm now raging, carries me back to eleven years ago to-day, when the "Daniel I Tenney" was lost off the coast of Scituate, in the disastrous November gale. The wrockage was strewn for miles along the whores of Scituate and Marshfield. A portion of the stern containing the name was thrown ashore opposite the writer's house I picked up some of the interior fluish of the cabin, and have made several pieces of furniture of it, which are prized quite highly by the owners is the sad ending of the career of that poble shin which so proudly braved the storms of old ocean so many years.

Perhaps some of your readers may be interested to know where the "Daniel I Tenney" laid her bones to

Sea View, Mass.

### THE INVENTOR OF THE STEAMBOAT

To the Editor of the Scientisk American
I beg to thank you for publishing my letter, as also for your courtesy in sending me the copies of your

I wish to point out that although I insist that it would be a most difficult matter to prove that any other of the so-called inventors have any just claim other of the so-called inventors have any just claim to priority, yet if any reliable proof of any "inventor" having produced a practically successful steamboat prior to 1748 is available, then I would once for all sink any claim on behalf of Jonathan Hulls, but in my humble opinion, from research I have made upon the subject, such is not possible. Therefore I boldly assort that he and he slone should have the great hon-ors ascribed to him. Will anyone refute that I claim practical success of his invention, but not

commercial success, and to do justice to an inven-tors memory, it should not be for the purpose of resor a memory, it abould not be for the purpose of re-quiring commercial success. He laid the foundation for commercial success this fact is undeniable, therefore why should be not have the bonors and dis-intection for his genius? Always remembering that he was many years about of his competitors.

I do not admit, what is so generally claimed, that it is not the man who invents, as the man who puts into actual practice, that is deserving of the hot Without the man who invents, there could not be any need Neither would he have any place for putting into practice that which he would otherwise have he knowledge of, had it not been for the earlier inventors

ppears clear that Jonathan Hulls, although the side-paddle boat had existed for many years propelled by both manual and animal labor, yet he was abso-lutely the first to suggest steam power to supersede both methods by steam propulsion. An original innovation of the stern wheeler And with his with the side naddles, his cisim to originality is made with the sing pagnets, his craim to originality is made doubly sure, always remembering the very early date of his invention and the very crude form of steam engine which then existed. Therefore the greater the honor that should be accorded to him

with regard to Fulton, no serious claim can stand in face of the foregoing. To put it mildly he was only a copylat in the matter of steam propulsion. I cannot too forcibly assert that Robert Fulton has no cannot too foreign seasor that thorse auton has no claim whatever, and this fact N S Arthur Daniel cor-roborates This gentleman asserts that "England should certainly set up a monument for Jonathan Hulls, as he was undoubledly the original inventor in England", and he further states "whether he actually built the boat or not is of no special conse-

have been able to provide proof that he did build his boat, and that it was a practical success quently, any additional proofs I have supporting him -- and they are numerous --would be quite superfluous. There could not possibly be more than one inventor of steam navigation, whatever adjectives b J. Hoores HULLS

Manor Park, Essex, England

## GLASS ESPALIER WALLS.

### BY JACQUES BOYER

In the cultivation of fruits on the espailer system the trees and vines are planted along a wall of stose or brick to with all their branches are arefully attached so as to spread them out into a plane sur for an all allow free access of light and sir to every part. Ordinarily the direction of the wall is determed to the control of the wall is determed to the control of the wall and the varieties of a state of the varieties of varieti

with refer nce to his di Until very rerection Until very re-cently if the wall was built in an east and west direction so as to expose one face to the south the one tace to the south the other face was almost ; tirely wasted. In order to remedy this state of af fairs several fr it grow ers have conceived the idea of employing trans-parent espaller walls through which the light of the sun can penetrate to the trees planted on the north side of the wall Comte Horace de Choiseul in particular has conduct esting experiments of this sort on his estate at Viry Chatillon in the Depart ment of Beine et Oise ment of Seme-et Olse and has obtained some very promising results. He built a glass wall 6½ feet high and about 60 feet long extending in an east

and west dire tion and

and west dire tion and planted fitteen pear trees of the variety Winter Doynu on each side north and south Ti baring surface of the wall amounted to about 26 squar yards on each side or The south side yielded 134 pears of a total weight of 31 pounds and the north side bore 119 and total weight of 32 pounds and the north side bore 150 pears within the 132 of sounds and the 132 of sounds and 132 of sound poars weight of 77 pounds and the north size nore its pars weight of 77 pounds making in all 245 pears with an aggregate weight of 168 pounds. All of the pears were of parti ularly fine appearance without blem ishes of any kind and it is a remarkable fact that the fruit which was gathered from the north face of the

fruit which was gathered from the north face of the wall was even smoother of skin than that which was produced on the southers side. Each square yard of the giass wall produced nine or ten pears of an aver age weight of about 11 ounces. Another atspringent with giass espailer walls has been made by MM Croux & Sons in their nursery at Val & daulary in the Department of the Solies. The wall which they constructed also lies east and west and consequently presents northern and southern ex

par yir g photographs show par yir g photographs show the wall is surmounted by a glazed roof projecting on each side Along on h fa e of the wall were planted Calville apples Win Doyen Passe-Crassa Winter and Directrer Alphand pears together with pea h trees and grape vines care being taken to place the same varieties on ea h con parison easy a d a u

In 1907 these trees and vines produ ed their first crop in which no differ en e betwen the fruit produvd from the north and so the sides of the wall old be deeted. The same result as shown by the ros of 1908 and 1909 There is indeed little

There is indeed little diff rence in temperature between the north and south fa es as he former is heated by the solar rays whi h traverse the gass and ite latter is cooler than the so th elde of a masoury wall for the very reason that some of the incident solar radi

through the glass and consequently less is reflected and absorbed. This difference in absorbing power how and absorbed This difference in absorbing power how wer makes the giase wall inferior to the mascar; wall in the matter of warming the plants and protecting them from frost night. A masoury wall absorbe a great deal of heat during the day and gives it out at ight but this effect is comparatively small in the case of a wall of glam

In the matter of cost there is little difference be-



A GLASS ESPALIER WALL GOUTH SIDES

tween the glass at d the masonry walls. The cathedral glass enployed by MM Croux costs about \$6 or \$7 per linear yard of wall 8 feet high including the cost of linear pard of vall 8 feet high including the cost of the giased roof projecting zowe both sides. A masonry wall of the same height would cost \$4 or \$6 a, pard and the addition of the giased roof which of course is equally necessary in this case would raise the total cost to \$6 or \$3 per linear pard More extensive and long-restituted experiments must be made however-belore it will be possible to procuouse a positive offsis icn concerning the relative merits of glass and ma-soury sepalier valls

There is now a prospect of a thorough, explicit can sus of the population of China. To grasp what this signifies one must first remember that China is vastly the most populous state of the whole world and second ly that hitherto such estimates of the number of its

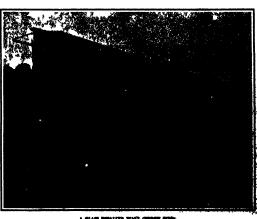
inhabitants as have been published have fluctuated between 100 000 000 and 100 000 000 any Commontly that the present day the number of natives in Othas is meetined as 400 to 400 millions, but capper pageragely are breath that number as greatly indisted. In many into books in consequence the resident finds only 300 millions ratied as the probable actest of the population Neutraphy in occurs to the thinker that the importance of all suppositions in regard to a yellow partie and the state of the suppositions of the stricker that the majortance of all suppositions in the thinker that the importance of all suppositions in the stricker that the majortance of all suppositions and the stricker is the supposition of the stricker is the supposition of the stricker.

pend very largely on a sure calculation of the size of the population of China Of course in the course Of course in the centre of former canturies the Chinese government projected and made at least the semblance of various consuces so that when they were published they were found to be mostly more statements of the approximate number of flam proximate number of flats illes and were therefore quite unreliable. And the shadowy value of such consume was not improved.

whichovy value of used comments was not improved by the way by the olds namer of the growth of the way by the content of the individual provents of the province who when a consens was ordered for the purpose of military constriction or of collection or apply the content of the property of the province was not the whole Chinace and in the double form most of a consum of families and a consum of individuals. The former is to be ready by the early part of 1910 the latter by 1911. In view of the immense status of the Chinese Happire the wasterness of this state can hardly be overestimated and the translated overwite by the present accellent organization of the Simpire though the fact cannot be ignored that certain parts of the Himpire does themselves wholly independent and will therefore resist in such districts or will try through the stiff the scenario for the construction of the construction of

published result of the double form of the census

Concrete poles hess al in shape and hollow through the center are used by the Okiahoma Gas used by the Ohishoma ven-and Electric Company A St-foot pole measures ? Inches girost corners at the top and 16 inches across at the butt. They are moided in version sades up of 8-foot sections, so that it is passible to step a



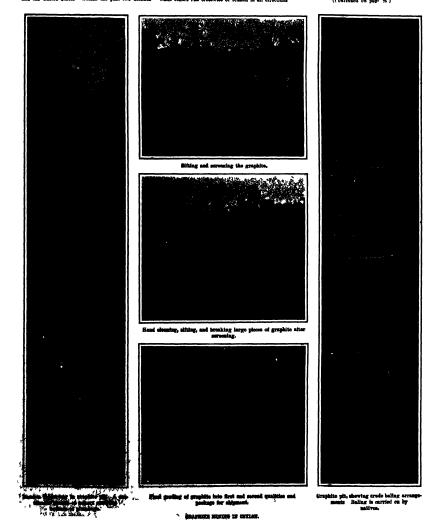
A SEASO DESCRIPTION WAS ASSOCIATED.

# GRAPHITE MINING IN CEYLON

## BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Among the various interests found in the island of Copion, that which is the most abundant is graphited or plantage, practically the only one found in most indeed a state of the property of the control of the state of the control of the statistic of the control of the statistic of the control of the statistic of the control of the state of the composition being practically pure carbon and in its statestay demand for credities. The average output is approximately 50 000 tons per annum the greater part of which is approximately form of the control of the co

the trude has undergone considerable expansion with
the result that mining is being extensively developed.
The mineral is found is well and notes to the very
trailine recks occurring frequently in a fibrous or flary
from the flakes being disposed at right angles to
the wall of the vein These veins vary in width semstime being issue than an eighth of an inch while to
the others that yell extend to seweral feet. Some are found
to follow the foliation planes of the various residence
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# RUFUS PORTER AND HIS "FLYING SHIP."



BY C. E. McCLUER.

Soon after the Montgolflers invented their first "hotair' balloon, which was almost immediately followed by the first 'gas balloon, the attention of scientists and inventors seems to have been centered on the apherical and slongated gas bag as a means of flota-tion, and the provision of propellers and rudders to tion, and the provision of propellers and rudders to enable the navigator to control the movements of the unwindy and wind-tossed sphere, and produce what is now known and briefly described as a "dirigible" balloon Omitting all reference to the work of the many accomplished and venturesome balloonists who originated or copied the various devices which they adopted for the guidance and management of their spherical or pear-shaped, or elongated and cigar-shaped gas envelopes, we will revert at once to the

Rutus Porter, belonging to that numerous class of enious New Englanders usually styled "Yankee in-tors' was born at West Boxford, Mass., May 1st, 1792 and died in New Haven, Conn. August 13th, 1884 Although he received only a common district

varying success, his journalistic enterprise was pur-chased by the present proprietors of the SCHRYLING

nong Porter's less noticed inventions, and the one from which I presume he reaped the smallest recom-pense, was a flying machine, or as now styled, a "dirigible" balloon, but which he dubbed an "sere-As nearly as I can ascertain from the records at my command, this invention was made and pat-ented in 1820, but not until 1852 did Porter seem to make any serious effort to exploit the device. In that make any serious error to exploit the device. In that year he organised what he called "The Asrial Naviga-tion Company," and attempted to raise the funds neces-sary to enable him to construct his first seroport by an appeal to popular support through the sale of \$5 bonds or certificates.

bonds or certificates.

Among the papers of my decessed father I have recently found one of these bonds, issued to him under
date of April 28th, 1852, a facsimile of which is reprinted herewith

Below follows an abbreviated copy of the "proposi

not exceed \$35 per day it is ascertained by a misech and careful estimate that an aeroport 150 test long and capable of carrying five persons at a speed of sixty miles per hour, may be constructed for \$1,500. Now, having been disappointed of the funds requisite to put this invention in operation on a scale of practo put this invention in operation on a sense or prior tions utility. I propose that if three hundred persons will subscribe five dollars each, payable when the whole amount of 1,500 dollars shall have been subwhele amount of 1,500 dollars shall have been unbescribed, I will forthwith construct this pineser serroport, (which may be done in six weeks), and when this put in operation I can readily command the requisits funds for constructions a large servoport as aboves men-timed. And I will sea exrame that each subscriber on the payment of the safe mus of 500 dollars, shall be trunhed with a requirer title dock which shall estitis the holder thereof to one three-hound-roth part of the first servoper, and also to one three-hound-roth part of the first servoper, and also to one three-hound-roth part of the first servoper, and also to one three-hound-roth part of the first servoper, and also to one dollars and constitution and of all benefits and encolumned that may be derived therefrom for twenty years, the said asroport



PACSIMILE OF THE ARRIAL WAVIGATION COMPANY BOND WHICH SHOWS THE PORTER AUROPORT RESISTRIC CAR

school education, he possessed an alert mind and a retentive memory, which, coupled with a natural genius for observation and invention, fitted him ad mirably for an active and useful life. He early disnursiny for an active and userul life. He early dis-played inventive abilities of no mean order, as is at tested by the list or his patented inventions disclosed by the records of the Patent Office. Some of this patents displayed an acumen and foresight which led him into the van of progress, and proved that he was fully abreast if not actually alread of his time. Among his numerous patented inventions we find enumerated a cord making machine a steam carriage or ordinary road vehicle, prophetic of the latter day automobile, a ploneer treadmill horse power machine, a corn sheller, the inevitable Yankoe churn, a washing machine, a signal telegraph, and a municipal fire-alarm system, the latter doubtless being the forerunner of the largely adopted and efficient Gamewell fire-alarm

system, now so largely in vogue. In 1840 we find Porter as editor of The New York in 1840 we find Porter as editor of The New York Mechanic, the first purely scientific newspaper pub-lighed in the United States. The next year it was re-tflowed to Boston and the title changed to The American Mechanic in 1845, evidently not having made a pronounced success with the publication of The Ameripronounced success with the publication of the same-can Mechanic be returned to New York and begin the publication of another journal which he styled "Scien-tific American, the Advocate of industry and Enterprise, and Journal of Mechanical and Other Imp ments, on a cash capital of \$100. The first number of the new periodical was issued on the 28th day of August, 1845 After six months of struggle, with tion and prospectus" alluded to in the bond, as 1 find it printed in the imue of the National Intelligencer of March 19th, 1852

"THE FLYING BRIP"

"A chance to secure a cash income of \$10 to \$20 per week for twenty years by the investment of five

"It is extensively known that the undersigned has by theory and practical experiments so fully demon-strated the practicability of serial navigation that all who have fully examined the subject are convinced, who have fully examined the subject are convinced, and no person, even of those whose interests are ad-verse to its success, can offer a word of rational ar-gument against it. Several model machines have been constructed, and each of them has operated accessfully, and no of them, skitten feet long, car-ried a small steam segies, by the power of which the machines was proposited, and, being guided by its own machines was proposited, and, being guided by its own beim, travelled rapidly through the air, even against a breeze of wind, in direct lines or circles, according to the adjustment of its beim. This machine was wit-nessed and applauded by hundreds in New York and Boston and notices thereof were published in several source and notices thereof were published in several newspapers of those cities at the time Since those experiments were made the inventor has made addi-tional improvements whereby the invention is nove perfected. And it appears certain that a sate and perroted. And it appears certain that a mate and durable sortial ship (or aemport), expeble of carry-ing one hundred and fifty passengers at a speed of ninety miles an hour, with more perfect askey than either steamboat or railroad cars, may be censerveded for \$15,000, and that the expense of retuining it will to be kept in repair without expense to the share-holders. . Washington, March 18th, 1852. Rufus

While with the added knowledge and experience of while with the saded knowledge and experience of a half century we can see wherein Porter was mis-taken in his calculations and visionary to a consider-able degree, we can also see wherein he was in adtaken in his exiculations and viriouary to a considerable degree, we can also see wherein he was in advance of his day and generation, and prepared to achieve the seconds that later and quite recently achieve the seconds that later and quite recently scholerable and the second that the present day, had he but been in possession of the passilite or handowly more as always applied to circular printed on the bond, one channel help being struct with in recentlance to the bonders directly height printed on the bond, one channel help being struct with in recentlance to the bonders directly height printed on the bond. One channel help being struct with in the recentlance of the bonders directly height printed and printed printed and discharge the printed printed and discharge the printed printed and printed printed and printed printed and the printed printed printed printed printed and the printed printe



INITATION WARRIN

A simple method of imitating marble with all its beautiful velo markings spots, and irregular lines and variable colors, is as follows

ne skill in giving the veining, etc, to the product will be quickly attained by making a few small slabs in a plain way previous to undertaking the production of a larger number The colors for the veining must all be of a mineral character, as follows plus (black lead), chrome green (dark), common crocus,



IMITATION MARRIE

yellow other, red oxide of iron, and ultramarine blue Procure a few pieces of stout sheet glass, say 7 inches by 11 inches (an ordinary 11 x 14 photographic nega-tive cleaned and cut in halves is just the thing) Make a wooden frame of ½ inch board, an inch deep with a division in the middle, simply held together with I inch iron brads not driven firmly in Leave of an inch projecting so that they can be easily withdrawn with a pair of pilers. Arrange these strips of wood, after being smoothly planed all over, so as to give two squares of five inches internal

Make up the following in a bottle ounce, benzine, 1/2 pint Place this, well corked in a warm room to dissolve, aid this by shaking it occa a warm room to cassove, and this by shaking it occasionally. When the paradin is dissolved it is ready for use. Brush some of this preparation all over the inside of the wooden panel. Then take a piece of Canton Sannel or soft rag, wet it with the bearine mixture, rand this well all over the smooth side of the glass plate, polish it thoroughly with two pieces of soft rag until there appears to be nothing left and place the frame upon the glass plate Now lay a mirror, or a piece of plain slivered glass upon the work bench, or table, and place a block of wood at each end so that the glass plate and frame will rest about four inches above the mirror the frame he-ing held in place by a couple of rubber bands Place a teaspoontul of throme green in a small saurer and a teaspoontul of black load in another saucer and add a dessertspoonful of water to each

Mix the following in any suitable vessel (a small stoneware pitcher being well suited) To ten ounces summers piccar using was suited). To ten ounces of water add sufficient plaster of Paris to make a mixture of the consistency of thick cream. Skim of the air bubbles and any dust that

may float on top, when in the course of a minute or two the plan course of a minute or two the plas-ter must be poured carefully into one side of the square on top of the giase plato. Fill this nearly half way. Pour the remaining portion into the other square. Now dip a small brush into the mois-tened black lead, press it through the soft plaster and paint the plain or recommendation. or sig-sag veining or spots. The plaster blends beautifully with the color and the mirror enables one color and the mirror caables one to see the affects produced. Any line made too strong or lumpy in the made too strong or lumpy in the produced of the produced of the forest of the for

anne way. Eaving now produced the velating, the block may be refindreed as follows; Have ready to hand a few pieces of gathwhiled twen netting. Out a place this place was the symmetry of an hash or introduction of the piece with a quantity of an hash or introduction becomes on the piece with many one attention to the piece with many one attention. In the same pitcher that the planes was those down many the same quantity of protripts of many pieces down many the pieces with many one attention. The same appearing to protripts of protripts of protripts of protripts of the pieces of the

small quantity at a time, pour the mixture upon the plaster and wire netting until the panel is filled. Treat the second square in the same way, allow the Treat the second square is the same way, allow the whole to stand for an hour, nutil both plaster and cement have become value set. As soon as all has become well set, draw out the brade with a pair of pliers and remove the woodwork carwfully. This will hasten the drying Take care not to shift the cast blocks upon the glass plate Let them become quite dry while in contact. When dry the colors will not dry while in contact. When dry the colors will not be more than one-third as brilliant as when wet, the be more than one-third as Drilliant as when wei, the effect being precisely like marble. The face of these blocks will possess very smooth surfaces with only a partial gloss upon them, being at the same time por one. The poresity can be stopped and the gloss much improved by the use of amplacetate colloidion. This is practically a solution of gun cotton in amylacetate which not only fills the pores of the plaster, but forms a coating as clear and transparent as water. It re-sists the action of weak acids and alkalies and can be washed with water and a chamois leather at any time without injury to the object it covers

When the squares are perfectly dry and slightly arm they must be placed in a plate or large saucer, containing a mixture of amylacetate collection and one containing a mixture of amylacetate condon and out-third amylacetate. This thin collodion will penetrate the porce of the plaster for a quarter of an inch or more in a short time. Remove the square and stand the porce of the plaster for a quarter of an inch or more in a short time. Remove the square and stand on one corner to dry in a warm place. When dry a couling of the thick amplacetar collection may be brushed upon the surface and silowed to drain from the opposite coner. The surface will improve in brightness with every coaling. Amplacetate collection costs about two dollars per gallon at any wholesals chemists. A gailon will go a long way in water-promise such also be finitistion marbin as here described

much harder material with a slight grain can be produced by mixing a small quantity of ground pum tee or ground glass with the plaster which must be intimately mixed to insure uniformity. This mixture or termed Parisa coment. Imitation marble orks can be made by the above process into any shape such as a keystone for a mantelplece or circular with an inlaid border and in many other ways that will suit the taste of the individual worker. In place of Portland cement, Parian cement may be used as de scribed above, thus producing a slab of an almost un form color. Any size of slab may be made as described.
Of course the thickness must increase with the size of the slab to give strength

### SOME CURIOUS CHEMICAL SROWTHS

BY ALPRED P MORGAN The following experiments are somewhat out of the ordinary but may be performed with the materials at hand in any chemical laboratory, or obtainable at a well-stocked drug store

first experiment mercury is prepared by in the first experiment mercury is prepared by throwing into it small pieces of clean metalik sodium. The sodium will almost immediately take fire and have a hard crust on the surface of the mercury. Break this crust with a glass rod and stir it in the mercury until it dissolves. The little pill bottle on the right in the illustration contains five cubic centi meters of mercury having sodium dissolved in it The tumbler on the left shows five cubic centimeters trans formed into 'ammonium amaigam,' and occupying a space over iffty times the original volume of the mer-The transformation was brought about by



PLANT-LIKE GROWTHS DUE TO CHMOTIC

throwing the mercury juto a tumbler containing a throwing the mercury into a tumbler containing a strong solution of sal ammoniate in water The mercury immediately swells up into a spongy mass. The time elapsing between the moment when the sodium analgam was thrown into ammonium chierde and the taking of the photograph illustrated here was about thirty seconds.

The reaction may be represented as follows '(Na dissolved in Hg) and NH,Cl = (NH, dissolved in Hg)

mination of the mass, it is seen to be very

spongy in nature, and its growth in all probability caused by the evolution of a gas. This is indeed the true explanation of the phenomenon The NH, of the ammonium chloride dissolves in the mercury but soon the mass decomposes, and bubbles of ammonia and hydrogen gas cause the enlargement.

in a few moments the mass will begin to sink, and a strong smell of ammonia will be noticeable. If a lighted match is held over the small bubbles arising righted match is need over the small cubbles arising from the liquid, they will burn, lighting with the "pop" indicative of hydrogen The mercury will soon re-turn to its normal condition, in accordance with the following equation

2 NII, dissolved in Hg = 2 NH, + H, + HThere can be no doubt that the NH, is actually pres ent in solution in the mercury, for when a sait of am monium is decomposed by electrolysis, the NH, ion monium is decomposed by discriptions, the NH, ion upon its discharge given ammonia and hydrogen and no NH, is formed But if a pool of mercury is used as the negative electrode the NH, dissolves in the mercury and forms an analgam with it. However, during the formation it swells up and gives off the products mentioned above



GROWTH OF ALUMINIUM OXIDE ON A TELEPHONE

The most interesting point about this experiment is that it is in accordance with the theory that ammon lum would have the properties of a metal if it could be isolated for excepting this substance the metals themselves can only be dissolved in mercury

The second photograph is an illustration of an ex-oriment depending upon the peculiar property of aluminium amalyam

The action of sulphuric and nitric acids upon ordinary aluminium is very slow because the metal re-ceives a coating of aluminium hydroxide and is shielded from the acid, but if the aluminium is amal gamated with mercury, the action is very rapid

Aluminium has a very great affinity for oxygen, and will displace all the metals save magnesium from their oxides. If a mixture of aluminium powder and ferric oxide is placed in a crucible, and fired by means of a place of burning magnesium, a violent reaction takes place enough heat being produced to leave the iron, which is one of the products in a highly molten state. This is the principle of the "thermite" used for weld ing, et

### $F_1 O_1 + 2 A1 = A1.0. + 2 Fe$

Some idea of the speed of reaction and the heat generated may be gained if three small iron crucibles are placed in a virileal column, one above the other and separated five or six inches. A mixture of aluminium and ferric oxide is placed in the top crucible and ig-lifed. Almost immediately molten from still melt its way through the bottom of the first crucible and pass way through the bottom of the first crucible and pass way through the bottom of the first crucible and pass through the second and third as if there was nothing in the way. A box of soud should be placed beneath the bottom crutible to catch the molten metal. The affailty of aluminium for oxygen can be shown

by amalgamating a piece of the motal with mercury. The surface is almost immediately oxidized and the result is a growth of white tufts of aluminium oxide over the tutts of aluminium oxide over the surface of the inetal where it has been amalgamated. The growth will rise about one eighth of an inch or more in five minutes.

The englest method of amales. mating the aluminium is to clean a small portion, and then drop upon it some mercuric nitrate solution and allow it to dry. The growth

will immediately commence in the illustration, the case of an aluminium backed telephone receiver has been used for the experiment, and the resulting growth is shown by the white spots, principally on top at the left

The third photograph is a striking illustration of osmotic pressure. The tail plant like growths may be formed by throwing small pleces of any of the follow-ing crystalline chemicals. Ferric plicate copper shoring crystaline chemicals terric nitrate copper tunor die cobait intrate, fickel sulphate and manganess sulphate into a beaker glass containing a diluted solution of sodium silicate of il specific gravity. The crystals will almost immediately sprout up into vari ous fantastic shapes, and grow several inches in the course of a few minutes.

The saits dissolve in the water of the sodium sill



A SPONGE-LIKE TRANSFORMATION AF MURGERY

cate solution and react with the sodium silicate to form a silicate of the metal of the salt added. For instance in the case of copper chloride copper silicate is formed

(ucl, + Na,BiO, = Cu8iO, + 2 NaCl
Billicate of copper is insoluble and so the result of
the reaction is a small portion of liquid around the
trystal of Cutl, surrounded by a sack of insoluble
Cu8iO where the copper chloride has come into con tact with the sodium silicate

Particles of a dissolved sul stones exercise a pro similar to that of a gas explained in physics texts under the title of the kinetic molecular hypothesis. When the sa k is first formed the pressure is equal

on both sides but as more of the copper chloride dis on both states but as more of the copper coloride un-solves the pressure on the inside of the suck becomes so great that it bursts at the top where the hydrostatic pressure of the liquid is least and the suck weaker The liquid apurting out of the top is immediately

surrounded by a new sack and the process continues until the salt is exhausted or the growth reaches the e of the liquid

The silicates of the metals of the saits mentioned in the list above are also insoluble and the same explans tion holds true for their action

### WIRELESS EXPERIMENTS WITH A STATIO

MACRINE

In the large quantity of literature on wire graphy practically the only method described of pro-ducing the high tension currents required is that of using a powerful induction corrects required is that of using a powerful induction coil or a high tension trans-former on an alternating current. The possibility of utilizing the discharge from a direct generator of static electricity is herely touched upon. In order to t at the practicability of the use of such a source of current the writer constructed a static machine of the Wimshurst pattern and made some experiments with Wimmburst pattern and made some experiments with it. The machine a photograp is of which is shown herewith was fitted with two glass plates twenty insher in diameter supported on a half inch steel shatt Each plate had thirty sectors of heavy tinfoil 3½ linches long. The brass work was made from 116th round rod and the brass bails on the oblictors and Leyden jars were pur-

chased from a manufacturer of brass bed steads as were the large balls terminating stead as were the large balls terminating the discharge rods and the sending device below These balls were filled with crushed tinfoll and contact made by inserting the supporting rods in wooden bushings fitted in the necks of the balls

in the necks of the balls

The two Leyden jars showing at the front of the
machine were made from hydrometer glasses provided
with feet and each had a combined inner and outer
coating of 85 square inches of foil The interior out coating of so aquart incress or for I has interior out. ings were arranged to be connected with the discharge rods by short loops of brass chain and the exteriors joined with a similar chain laid along the base of the machin. The device shown attached to the front support is the key by which the spark is thrown into the aerial and ground and the messages sent By pressing the lower lever the rocking arm above it preasing the lower lever the recking arm above it with a supports the two insulated balls is pulled upward and the latter are thrown into range of the spark from the dish harpe balls in onnected to the serial and the other to a good ground such as a gas or water pipe 1 found it best to allow the acrial ball to take its charge from the positive discharger By pressing the key for longer or short; intrivate the dots and dashes of the code are easily obsticated. are easily obtainable

An acrial was r (ted on my roof at a beight of 45 feet above the ground consisting of two horizontal copper wir s supported on two-foot spreaders with leads off n ar the center running to the edge of the roof where they were joined and a single wire ied then a to the nachine on the third floor. This aertal gave a wave length of about 72 meters. Owing to the extra rely high tension and evanescent nature of the discharge it was ne essary to insulate the wires with ar at care which was done by supporting them in par affin I plass tubes. The machine as constructed gave

a solid siream of bright twoin h starks re sembling those from an induction oil was chark balls were use I and the jars uncon nected With the latter in cir cuit in the usual manner a very powerful spark of about the was obtained at intervals. With a large bell on the right hand rod and a small one on the loft, a mach thinner and more frequent spark from five to six inches long appeared. The first experiments in scading messages were con-

ducted with the receiver in a room about thirty feet away from the machine, using a gaspipe ground and



Fig 1 -- CRATING WHICH GIVES THE COLOR

no receiving serial A number of detectors were one structed experimentally in luding a coherer and de coherer with a ¼ inch gap filled with nickel silver fillings a microphone consisting of a piece of hard pencil lead bridging two stoel needles a bare point electrolytic and a Marconi magnetic detecter. In all the tests made the coherer gave the best results at short range and the microphone the best for long indeed the sounds were much cle distance this case than when the electrolytic was used though the latter is considered the most sensitive of all



For S -DIAGRAM EXPLAINING THE COLOR ILLUSION

In these experiments a home made relay of 200 chms resistance was used with the coherer and a pair of 75-ohm ear phones with the microphone. In the experiment conducted in the near by room the straight experiment conducted in the near by room the stranger spark from the discharge bells was used and gave clear signals. The coherer was then moved to the back yard and provided with a ten foot aerial stretched horisontally six feet above the ground the other connection being to a water pipe. The signals were still received charly but on increasing the distance to three hundred yards no result was obtained with either eiver although the serial was extended to a length of thirty feet

crease the power of the spark the inner coatings of the lars were conne the outer coatings still remaining un-

By this arrangement a shorter thicker and more brilliant spark was thrown into the key balls which while not as frequent as in the former case was suffi ciently continuous to easily permit sending distinct dots and dashes when the machine was driven at a dots and dashes when the machine was driven at a slightly higher speed. The microphone now responded clearly when the key was worked showing the in crease in efficiency of the new arrangement and a more ambitious experiment was decided upon "he more amounts reperiment was occased upon "ne receiving station including microphone telephone receiver tuning coil batteries, etc was transferred to a house three-quarters of a mile away and a receiving acreal erected As the owner of the house objected to the use of the roof for this purpose I was compelled

is year up a pichler testificials función et e vertical type, protection flows in high-printy reads delinear protection flows in the protection of the printy protection of the printy protection of the printy protection of the printy flow of the printy

of Leyden jars and so send greatly increased into the aerial and increase the radius of ef-The drain of the spark gap showing the character of the spark as given from the interiors of the jars alone as used in the foregoing experiments are shown in one of the photographs. The receiving apparatus with the exception of the tuning coil is also shown

### A COLOR AND RELIEF ILLUSTRE

Hold a pin vertically with its pointed end between the thumb and forefinger Place the pin thus held before your eye in contact with your cyclid Close the other eye and look at the drawing Fig 1 this bring at a distance of about three to five inches from

bring at a distance of about three to dree inches from jour eye. Two differently colored gratings apparently placed at two different distances from the eye both of them made up of vertical lines will immediately appear to be a second to be relatively near its lines have a dark brownish have The other is made up of dark bluish as a distance behind the first grating if the figure be moved laierally the near-by brownish lines are seen to move on with the paper but the bluish bars run in the op-near distretion.

the paper but the bishab hars run in the oppositic direction

The near-by brownish bars are the black
stripes of the figure In spite of the finct
that the distance between the figure and
to the stripe are not much blurred as the pit of
creases the aperture of the pupil and thereby increases

the depth of focus

The far away bluish bars are the shadows cast by The narway ordina data are in a mandows cast by the pin on the retina in the middle of every luminous bean sent by the corresponding white line The shade is cast right side up but the retina inverts it and the result is the curious inverse motion of the blush bars when the paper or pin is made to travel

interary The origin of the bluish color of these bars is shown on Fig 2 L L is the cross section of a white line The pin P (relative size is exaggarated) closes shown on Fig. 1. Let be rose sections of a winds as the accurate prior of the cruralities less and as the achronatum of the persphery is imperfect there is a rather strong dispersion of the white light. The bine rays R B of the shaded spectrum invade the obscure central sone which is the shadow of the pin. This assumes a birish hue. For a similar reason the less retrangilate olorer red and relive high pinh dead of the white like. The assumes a birish hue. For a similar reason the less than the contract of the white likes. The admixture of colored light to the dark stripts in increased by the fact that the whole image being out of from the limit between the black and white lines councils to sharp.

The blue rays most to a forces before the red and relieve rays that give therefore the inspression of coming from a far-qway luminous object. The contract in part for the fact that the brewends have seem to be mearer than the hitsish lines. The

writer con that this net instruty aut





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driving shaft is operably connect piston through slots in opposit, cylinder

oylinder
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(19163) J. V. S. mays Kindly help we in an argument. We agree upon the fact that the upper part of a wheel travels faster than the lower part of a wheel travels faster than the lower part when the wheel is peaked that the lower part when the whole is driven from the rester, as is the case with the rear wheel of an attention of a bound of a stochast of a work of an attention of a way or another, from the caster or drauged to a hover it should be able to the contract with the read to a lower than the cast of the wheel is contact with the road is at rest on the such to rail, the bank as reformed to the point of contact with the carts. We have fully discussed this in As were to Gorden's Aul 22, Nos. (As 0 in the work of the carts of the whole as reformed to the point of contact with the carts. We have fully discussed this in As to the the carts. We have fully discussed this in As to the the carts of the whole as reformed to the point of contact with the carts. We have fully discussed this in As to be a supported to the point of the p

Correspondence Cummu et ve ve, now, and in vol. 100, No. 20, price 10 cents sech.

(12164) J. T. S. says Will you kindly for line how I can improve the accustic of my relative noun. If he of red long, 20 feet lon

(12165) J H B says 1 What is the highest resistance that an ordinary dry coll can or recom? How much current will an elec-tromagnet wound to four others resistance uses Also, will one wound to twenty ohus use more or temagnet wound to four chains relationer used.

Also, will one wound to tentry chains use more or less current? A The current which a dry cell in the control of the contro

he magnet pole 15 to 20 times.

(13166) J H C. says Steel resists
he power of magnetism more than soft iren
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magnet. Now suppose you have a pleve of magmagnet. Now suppose you have a pleve of magmore than the steel of the steel of the steel
magnet. He steel than the steel of the steel
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magnet time is destroyed, and then tempered he a
may will be saturated. The degree of magnetism
are will be saturated. The degree of magnetism
which constitutes statustion will not be affected
the kind of steel and the magnetic force to
which it is subjected.

(12167) H A B. says 1 Would you (13147) H & B. says 1 Would you have kindly first lies he large a spark would a Winshold reli lies he large a spark would a Winshold relies have indicated a water large spark and the first limited in the first limited in the large spark as the large spark as the spark is shortly as for a spark as long as the discussion of the large spark is at this blee line. With the jain the spark is shortly line. With the jain line is shortly line. The large spark is a start of the large spark is a start of the large spark in the spark is shortly line. The large spark is a spark in the large spark in the large spark in the large spark in l

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### INDEX OF INVENTIONS

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# (O)Holiside from page 21.) gal force effected by the band, causes

the ball to swerve during he man. ...
this operation, though the hand is revolved, the drum upon which the ball
jests in the palm or one is stationary.
This device is brought into action when hall to swerve during its flight. In This derive is brought into action when it is desired to give the ball a "ippin." There is a grove in the drum in the pain over which a band is passed, and which by mitable arrangements is carried to the same points as the "werre" pulsers. For imparting a pure spin to the ball, the pulser youting the hand as above described is thrown out of action, and simply the drum in the pain upon which the ball rests revolves during the crews of the arm on an axis nextled with water the ball rests revolves during the travel of the arm on an axis parallel with the drum and at right angles to the line of flight instead of revolving on an axis parallel with the line of flight, as in the action to produce swerve. If desired, both actions can be brought into use at the same time, and then the ball is given the same time, and then the call is given a compound or refractory gyration—which combination of swerve and spin—which delivery puzzles the most accomplished batsman because of the erratic and con-

stantly varying rotary axis of the ball. The device is aptly suited for practi and certee is a puty surfect or practis-ing purposes. The velocity of the bal-can be altered at will, and there is a "velocemeter" mounted on the machine to indicate the exact momentum during flight. The variations possible are very tensive, and no two successive balls and be delivered alike, the change being sected without the batsman being aware effected without the batman being aware of the fact, or if desired a cartain type of delivery can be repeated of fib Kerry gration can be appeated of fib Kerry protone the disverse of any particular protone the disverse of any particular bowler. The "break", i. e., the tangent to right or left produced when the ball strikes the ground, is measured by graduated sight, which also indivises the granular produced sight, which also indivises the erve of the ball to one side or the other during flight Similarly, the ball can be made to leave the "hand" at any point of the arm's travel, there being a series of stops to secure this end in this manner the pitch of the ball, that is the distance from the machine to the point where it comes into contact with the ground, can be easily varied, and similarly the ball can be made to strike the ground in such a way that after the im-

pact it shoots forward at great speed The machine is mounted on telescopic legs, and the height of the delivery of legs, and the height of the delivery of the ball can be made to coincide with that of any bowler whom it is desired possibly to imitate, the variable range be-ing from six to eight feet above the ing from any to eight feet above aground. The mechanism is also arranged to swivel on its body, so that the bowling arm can be pointed in any direction without moving the body. The arm is brought to the horisontal position by means of a lever, by which it is also trained and re d, and at the same time a disk is raised to warn the batsman of the im-pending delivery Every ball delivered is moreover registered automatically upon a

### AUTOMATIC BAILWAY SAFETY STOP.

(Continued from page 25)
duced the locking wedge into its normal The remarkable safety of this apparat-

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The whole inside story of these recent developments, with a forecast of the property of the senators of t

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nay debelate in order administic to pre-tion any trains stopped on the track, ste (5) The fact of the appaints being dis ables by breakings of the lover is nate mattenily signated to the sugne driver

matically signaled to the engine divi-tion the disk bearing the inscription " paratus out of working." Moreover, as cially ingenious construction enables apparatus even then to work as usual

apparatus event then to work as usual on possing over the seat signal. The working conditions of the appareties The working conditions of the appareties that the seat of the appareties of the seat of the threwing the lever back and then dissi-paring the apparatus. The sainty stop above described in constructed by the Gastlicshaft Tir Sagithburgung and Pa-tunts der Stabl- und Elecandustrie, of Berlin.

CRAPHITE RIBING IN CETIAN.

SAPRIYA HISTED IN CRIME.

(COnsistent from page 58)
not be determined without further examinate. Much smaller quantities of graphite occur as fakes in many of the granultee and in the crystalline limestones, when it invariably forms small tabular straided crystals with well-devloped band cleavage. In these cases, according to Dr. A. Commarsswamy, the dispute the page 50 pt. A. Commarsswamy, the dispute the page 50 pt. A. Commarsswamy, the dispute 50 pt. A. Commars, and there is no reason to suppose that it has been subsequently introduced.

Evidently the graphite in the ve been deposited at a time posterior to the consolidation of the granulites, and they are of the most typical character Usually are or the most typical character Usuany they consist of pure graphite with occa-sional evidences of more than one period of deposition in a soned structure of the vain Metamorphism of the surroundvain Metamorphism of the surround-ing rocks hear the voits is found on only a small scale, the rock surfaces in imma-diate contact with graphite being impreg-nated with the carbon ne more than about half an inch Neither are the quarts and other interests associated with the graphite with filled with dis-seminated graphite, the latter occurring only in strings filling cavities or cracks in

the quarts. It is evident that the depo-sition of the graphite must have been from vapors or liquids asturated with mineral (carboniferous) matter. The best producing districts are Ke-galla, Ruanwells, and Pasdum, but areas are found over the island with the ex-ception of the northern and eastern por-tions. The mining is almost exclusively in the hands of the natives, and primitive methods obtain. There are but little or methods oftain. There are but little or-ganised means of prospecting A villager stumbling across evidences of graphite immediately completes arrangements for working it. A pit is susk until the vein or deposit is gained, and the mineral exor deposit is gained, and the mineral ex-tracted until the yield fails. When walk-ing through plumbago areas, numerous abundoned shallow pits may be seen alongside the roads.

the quarts. It is evident that the depo

shandowd shallow pits may be seen alongside the roads.

In the richer districts more methodical working is adopted, but even here there is a quaint antiquity about the substance of the respective of the respect



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studying this subject. The article written by hir Page Director of
the Office of Public Roads, describes with the been done.

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 This article is a complete description of devices which have been invested for the purpose of preventing chanffeers from taking out their owners, machine.

- & The Madern Chartele Auto
- 7 Making Your Own Repairs
- 8 The Core of 1810

Sensitives you have wondered what make of our Scientises you have wondered what make of our skinneds past your admiring eyes. The 19°0 Au will enable you to identify any car by its radiater as About therty-five automobiles are thus illustrated to a shatchy, artistic way

to The fee

d to own some kind of

- 11. The Woodsoful Rise of the Automobile Industry

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(Continued from page 86)
with the mineral which under the fric
tion of the bare fuch has a most brilliam
polish and is dangerously slippery ex
rept to the active mevements of the

The graphite is excavated by qually crude tools and instead of being helsted to the pit mouth by role and jull y is loaded into tall baskets of nativ n anu facture resembling small barr is loaded on the shoulders of the native who car ries it bodily up the long ladder to the lit mouth As a result in a busy pit there is a constant endless train of as there is a constant endiess train or as creating and desconding natives bearing their baskets swarming up and down like flies their bodies covered with jumbago brightly polished giving them it ap-rearance in it suplight of moving fig

ures wrought in bright steel
Should the pit become flooded a simple system is adopted A rude conduit formed of lengths of wood placed diago nally together so as to afford a V chan level a small orifice being bored through the side of the pit if necessary to secure
the outlet. The water is baled out by na

ives equipped with small vessels
At one or two of the pits where the velus are abnormally thick some pre-tunes to modern mining methods is made. The water is removed by the aid of steam jumps and the native arriers are dis-laced by pover hoisting jiants hauling the mineral from a d jut of fire of the nundred feet to the surfa At Pela watta the most ext naive workings in the Paduu korstel, such an installation has been laid down and her the prevailing conditions warrant it coulds for s i h machinery sin one main vein striking north and south has a maximum thick ness of twelve in hee Owing to the heavy

owing to the heavy demand for graphite that ensured as a result of the South African war when \$31 per ton was realized a plumbago fever broke out among the natives Su h a price induced indi vidual working and illicit mining on crown lands Even to-day the latter traf-fic takes place Should the mineral be no takes place. Should the mineral be proved to exist on the government prop-erty licensus are duly issued by the authorities to respectable individuals to exploit the deposits but the natives re-

ort to poaching

The graphite as it is mined is taken to the cleaning and grading works. It is first submitted to a preliminary hand se lection all the large pieces which are lection all the large plocts which are for the most part pure graphier or are associated with pyrites and scientic be-ing pisced on one side. The sixves com-prise across of varying mesh stretched on wooden frames inclined at an angle over which the mineral is emitted from small shallow baskets and then rubbed by hand the larger or coarser pieces fall ing to the lass of the screen while the minute particles ; ass through the meshes This process is repeated several times work being commenced first on the small est meshed acreens in this manner the dust and much of the friable loose earth is separated. This phase of the work is carried out by women and children

earried out by women and children illifting completed the graphite then undergoes leaning. The product being brought in from various localities may be found associated with other nature nath as tronstone or carbonaceous d posits of various descriptions and this deletations material is removed by hand. This op-eration also serves to separate the min

eration also serves to separate the min eral into two qualities the market price of which averages from \$17.0 to \$200 per ton for the first and from \$4 0.0 \$115 per ton for the second grade Thi Industry has attained great properity apward of \$30000 natives being sun poyed in the mining of the article the value of which production considerably exceeds \$5000000 per annum The in dustry is also for the greater part in the hands of the natives many of whom dustry is also for the greater part in the hands of the natives many of whom have amassed considerable fortunes since owing to the cheapness of the labor, ample supplies of which are readily avail-(Concluded on page 39)

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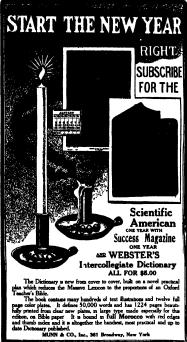
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### Handy Man's Workshop and Laboratory

Compiled and Edited by A. RUSSELL BOND

467 Pages. 370 Illustrations. Price \$2.00 postpaid.



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PVERT pretical mechanic, whether amstrer or professional, basis lose confronted many times with amerapeded situation of the professional control o

host first his loss of manners and revenue in various consistency of Medical Policy VI. The Handy Man's Experimental Laboratory VI. The Handy Man's Experimental Laboratory VI. The Handy Man's Month Medical Policy VII. The Handy Man's Month Medical Policy Medica

MINNE COMPANY he, 361 Broadway, NEW YORK

(Onsciuded from page St.)

able, while the capital outlay is said!,
a handsome profit is secured. The indus-try is however somewhat controlled by
the government, which levies an export ity of about \$2 per ton, representing an enual contribution to the revenues of the island of about \$100,000 The In creasing extension of crucibles in the metallurgical industries, and the result nt increased demand for graphite is re consible for the present flourishing con sponsible for the industry

Aluminium, as is well known is ex tracted from clay and it was Napoleon who styled it the "silver of clay" Formerly it was the practice to extract it from the clay with the aid of retorts More recently the electrical current is employed for this purpose with marked success, the cost of producing this valusuccess, the cost of producing this valu-able and by no means fully utilized metal, having by its employment been very much reduced in 1850 a pound of aluminium cost about \$40 nowadays it costs only about 20 cents. Above all other metals, aluminium has the gree cific lightness with the greatest durability and toughness It can be rolled, cut and drawn exceedingly fine This has made aluminium valuable and useful in the textile industrics. For many years, woven sleves or screens have been made of aluminium, which have proved indis-pensable in the sugar refining industry Its principal advantage consists in the fact that the surface of the aluminium, on the slightest exposure to the air beon the signification of the sir of comes covered with a coating of oxide which is capable of offering almost per fect resistance to foreign influences such as a tids, etc. This is likewise of great importance where supports in the control of the nportance where sluminium is used in

importance where annuming is used in the textile industries Speaking of actual weaving of alumi nium into special fabrics, particularly such as are intended for use for decorative purposes and costumes, it may stated that this is well and successfully practised in England. At the time of the Paris exhibition, there were shown as special attractions fabrics and clothes special attractions fabries and clothes made from fassa fib.rs. They were made from finely spun glass with silk. The fabries made from sjaminium do not need combination with other textle yarns Of late the most beautiful effects have been obtained by employing aluminium in smooth as well as twisted threads for the warp and as the weft slik varn of any desires color. They are silk varn of any desiree color they are used for evening cloaks and theatrical contumes. As the Pavill Woche says it makes the body of a beautiful woman look as though dipped in silver From aluminium, they are now making neck cloths pompadours showe belts neck these hawds and hais, and it is hard to mean the a little for the promesults. In little for the possibilities of the property of the prop prescribe a lin it for the possibilities of this metal. Very striking are not fabrics in combination with aluminium which constitutes a select novelty for interior decoration. Aluminium yarn made up into laces for ladics' shoes as well as used for straps, promises to be a feature of the coming season. constitutes a select novelty for interior

It would be quite an advantage to the notorist, states a contemporary, if he could communicate by wireless a hybridess a hybridess a hybridess a hybridess and his garage or the nearest repair abop in case of accident. An American inventor who is developing a system of wireless telephony recently made experi ments with portable apparatus to deter-mine the range of service of the instru-ment. He was able to communicate over mesh. He was anothe communitate over a short distance with a garage in New ark, but at a distance of eight miles the apparatus failed Apparently wireless (elephony will have to be developed far bayond its present efficiency before to an be of service to the motorist. The can be of service to the motorist. The chief dimouty is that only a anort trans-mitting antenna can be used, requiring an enormous expenditure of energy to reach a city garage, because of obstacles in the way, such as steel buildings, trace, wires, etc.



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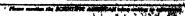
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previous fight standard. Even though we have learned the lessons all manufacturers have to learn by openions—even though we have manufacturing facilities as marry perfect as money and braine can make them—still we could not build a car of the quality of the 1910 Brush if we merely initiated the lag cars with all their ecompleated parts and all parts necessarily smaller and weake

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The most wonderful improvement in suom Car construction in years. While the balanced motor is the most remark-able feature of the 1910 Brish, we have made numerous other numerous and refinements.

numerous other nurrowinents and refinements. Here are some of them wheel-lase keighbened 6 inclus more graceful and rakesh lines. Mercacks type radiator new scheries control universal couplings-haft, improved dust-proof communator multiph duse low and reverse chiefes, fraismission control leves entirely lineared and otherpit more quiet multiple to the control of t

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NEW YORK, BATURDAY, JANUARY 15th, 1910

The Editor is always girel to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short and the fact mathematic the contributions will receive special agtention. Accepted articles will be paid for at regular space rates

#### THE 1910 AUTOMOBILE

ONVINCING vidence that the automobile of today is as far profested as the matrials of construction and mechanical in grainty will allow, in a stored by the fact that the cars shown in the two annual exhibitions that it is provided to a residual character as wore it not for the relatively short life and high cost of the tirre, the automobile would sarrly be entitled to rank as the most perfect and economical means of the present day. As to whether some cheaper and more durable substitute, having the same resiliency as rubber, will be found during the same resiliency as rubber, will be found during the same resiliency as rubber, will be found during the same resiliency as rubber, will be found during the substance will be produced At the same time, the development of the car has been along lines that are along the same than the same time, the development of the car has been along lines that are highly favorable to the life of the tire, for both the weight and the horse-power have been greatly reduced Morcover, the swrage owher is beginning to underbrake, in avoiding rough places on the road and in alowing down at curves, will add from fifty to one hundred per cent to the life of the tires.

The tendency toward standardization is even mormarked this year than last, and the fresk car is con spiceous by its absence. The predominance of the four-yillader motor would indicate that this is to be the prevailing type of the future. The six-yillader motor to being made, but in spile of its acknowledged advantages of more even torque etc., it is mainly confined to expensive cars of high power. An encouraging feature, based upon thoroughly sound mechanics, is the increased length of stroke, two of the leading makers exhibiting. 30-home-nower cars with cylinders 3½ inches by 5 inches stroke and 3½, inches by 5 inches stroke respectively.

Indoubredly, the present flood tide of prosperity in the automobile industry is due, largely to the fact that e multitude of people of moderate means, who have been waiting until a thoroughly serviceable are emtoded in the latter of the people of the people of the bookers of the latter of the people of the people of the Beveal makers are offering a four-cylinder Shlorsepower car having all the features of stylish deelag, accessibility to the parts, and ease and certainty of control, of the more centry designs for the low price of \$150. Cars of this type have proved during the past year that with judicious handling they are perfectly of \$100. The people of the people of the people of the year that with judicious handling they are perfectly of \$100. The four-cylinder, four-cylinder, with variations in the valve arrangements to suit the faster of the various buttlers has be come the standard type, and the indications are that uttimately the cylinders of the various buttlers has become the standard type, and the indications are that uttimately the cylinders will be cast or \$100. Transhark hall bearings have given place to bubblity parallel bearings of therein area, although a few first class makers are using a modified bubble of the standard practice.

seems to be established as to utanaster practice. There is a practically universal use of high-tension ignition. All machines down to the lowest periods, or magnetic with either a dual system of ignition. The phast drive is a almost exculsive use, the chain being reteriors of the state of t

Lubrication is effected mainly by two systems, one

emploring "uplash" lubrication, in which the exasts base strongs a bath of oil contained in the bottom of the resik case, and the other employing a trough and pump, which cases a constant and positive circulation through every bearing. Outside of a tendency to clarage the size there are so notable changes in the valve mechanism of American cars, and it is rather remarkable that, in spite of the increased use which is being made abroad of the sited valve (a distinctly American invention), there seems to be no disposition to develop this type in the land of its birth Atthough the multiple-disk ruleth bids fair to be-

Although the multiple-disk clutch bids fair to become the exclusive type abroad, the familiar, leathercovered once clutch has rendered such exercilent servtee on American machines that it still holds its own, and this in spite of the fact that the multiple-disk type has been giving good results on such American cars agare, then

as carry them
In the manufacture of car bodies, there is a marked
tendency toward the adoption of stratight line designs.
Several stylla-boding even, both of medium and migh
power, are shown with the much-tailseed torpode
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The question of the relative advantages of the righthand and left hand drive is coming to the front, and some makers are offering cars with steering wheel placed at the left of the car. Unquestionably the righthand position is preferable in those foreign countries and the composition of the relative terms and possing in the opposition of our own. The composition of our own passes to the left, and the driver, if seated on the right of the car, is in a two-mobe position for judging of the necessary clearance. In this country, where the rule of the road is neversed, it would seen logical also to

reverse also the position of the driver. The handsome display of moot trucks forms perhaps the most notable feature of this year's exhibition, no less than seventeen different makes of commercial motor vehicles being above at the Grand Central Pal according to the commercial motor vehicles being above at the Grand Central Pal according to the control of the contro

INFROVED QUALITY TREAST FRIGH REPOYING.

IVE years age or more, when a man pedd \$2,000 for a touring car, or \$600 to \$1,000 for a runabout, he scarrely expected and or \$1,500 for a runabout for a runabout for an externed a composite from the tent was a received a subject to the state of the

driving axles, and other vital parts. Conditions are very different in the present state of automobile development, when it becomes a matter of surprise to ever well-opered observers that eight out of thirty cars taking part lin the Glidden tour of 1906 should finish an arthouse trip of 3.540 miles run between Detroit, Chicage, Minosepoles, St. Louis, Destroit and Kanasa City in different supar at an average open of twenty miles as hours during the daylight resulting periods, without suffering a shaging inavolutary stop periods, without suffering a shaging inavolutary stop

for repairs, or for adjustments of may subt, so, the way except to brakes, carboreter, this ignition systems, and three. Considering the road and wealther confitions under which the work was deem and the last; of daily inspection, cleaning, and adjusting, this probably proposent as higher degree or defining and partyriance than can be shown for any other mechanical construction.

The wonderful improvement in montrear quality made evident by the results of this test and by a comparison of the specifications of the machines of today with these of machines esting at about the same prices in the early part of the decade now drawing to a close, as due to a number of contributing to a close, as due to a number of contributing to a close, as due to a number of contributing view of special grades of steel, bronze, aluminium, and babbitt having certain definite physical properties satind particularly to the requirements in different parts of the automobile The manufacture of finitions of the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was practically impossible until the them to the country was a compared to the country of the part of the country was a compared to the country of the physical properties of chrome-nicked models and vanished and vanished properties of chrome-nicked steel and vanished modern properties of chrome-nicked to work them.

Before the special alloy steels were brought out, the motor-ar manufacturers nearly reached the end of their resources in the effort to produce safe, durable care of satisfactory power and speed without excessive weight. The transformation that has been wrought in an out uncommon for specially treated chromosomer of the not uncommon for specially treated chromosomer of more than 200,000 pounds per square inch as compared with 50,000 pounds treatle strength of special prior of a quality used by wagon makers and also employed for certain purposes in automobiles. That of the special products and low-carbon of suspecial products of the special products and treason and interpretation of suspecial products of the special products of the special products of the special products of the special products and attreason, and how-carbon to discuss the special products and attreason, and throw the shafter and general out of allignances, and throw the shafter and general out of allignances, and throw the shafter and general out of allignances.

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and lighter gars sets than were used in care of 12,
b, and 20 borse-power five years ago, and that with
much greater certainty against breakage and the
practical climitation of the mangling of the ends of
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the first of the machine that must sustain heavy torsionals
trease, frequent and heavy impact, or much friction,
the designer has been enabled to keep down the weight
while constantly increasing the strength and life of
the machine as a whole. This accounts for the great
speed, power, quick acceleration, perfect manageshilly, and the degendability and durability of the
chaines of a quarter or third the power and half the
speed, built during the first half of the deende
All this improvement in quality, plus stiffnitsity more

speed, built during the flyst half of the deemde All this imprevenent in quality, plus infinitely more grace in general lines and in comfort to by passengers, and a complete equipment of footing top, pind shield, head lights, magnete, and other aupeaters fittings, its offered to the layer shinos, as no avanues in cost over the ungalaty, unconstraints, and poorty-equipped care of six and overs years, ago.

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#### ENGINEERING.

The Jungites retirway, which has formed the subprogress. About 130 men are engaged on the tunnel between Eismer station, 10,445 feet, and the Jungitess John, 1,406 feet above the sea level. The present indications are that the read will be completed toward the class of sett was

At the last meeting of the American Society of Naval Architects and Martine Engineers. In a paper on "Applications of Electricity to the Propulsion of Naval Vessals," If W. L. E. Emmett estimated the efficiency of the turbo-electric installation at 92 per cent, and be, at least, is of the opinion that no other form of speed reduction between turbine and propeller can be made to above qual efficiency.

In a recent article in one of the magnines, Admiral Evans takes a rather pessimistic view of the Internation of the Panama Canal He sees but little revenue in proposet, and apparently he holds the view that, unless the canal be declared free to all nevigation, it will succeed in attracting but a limited amount of abuse of the position that it cannot possibly charge a sufficient toil, at iteast during the early years of its operation, to pay the heavy fixed and operating charges.

A prise of \$5,000 has been offered in Engiand for a twenty four-hour aeroplam motor I aweight into twenty four-hour aeroplam motor. I aweight into gine must not exceed \$46 pounds, and it must develope to not less than 35 brake horse-power. The points who considered in making the award will be weight, further consumption, reliability, were of working possessing as security against fire, and minimum air resistances. The conditions are severe, but unquestionably motor is the weak point in the aeroplane at the present stage of its development.

Emphasite revilinony to the ability of relatored concrete to resid suchtapake above, is given by the coperts who were sent by the Japanese to Mension. The buildings that had been constructed of armoredconcrete, according to Prof. Amore, proved to behighly resistant, and mush significance was attached to the case of two reservoirs of considerable size, one of brick and the other of relatored concrete. The concrete structure received no Injury, whereas the prick reservoir was completely destroyed.

Recently gathered atoms turbine statistics, referring to the growth of this new type of eighte in the transition of the growth of this new type of eighte in was equipped with turbines as eccently as 1001 there are now kirty four vessels carrying this equipment of the aggregate home-power represented being 600,001 it is estimated that because of the lower pressure which can be used with the turbine, no less than 120 tons of weight was saved in the boiler room of the largest of the turbine propelled liners

Basislates published by the Interestate Commerce Commission show that during two years, out of 152 preventable collisions and devaluments, twosty-one of the accidents were due to the fallure of the locomotive engineers to observe the signals. Evidently the human element enters harpely into the question of the efficiency of block signaling. In view of this fact, it is encouracing to note the steady growth of automatic stop devices which, in case of failure of the engineer to the properties of the control of the properties of the control of the control of the control of the properties of the control of the control

With a view to guarding the safety of passengers and preserving the life of rails and rolling stock, the Chicago, Milweakee, and Puget Sound Railway will refrain from running high-spec trains over the new roadbed until it has had time to become thorough? to compected and a reasonable amount of stone or grave ballant has been tamped beneath the ties it takes place, and, agart from the relate of operation, the running of fast heavy trains over new track entails coutly sort in runawals and updeep

Any one who was familiar with the appearance of the Niagars Palls before the present power installations were built and opened, can settle the question as to whether the appearance of the falls has been affected, by the simple expedient, of going to see for install famili though the total amount of water taken for power purposes, in proportion to the total federate to cause the shallower persons of the overflow at the edges of the falls to become entirely dry, thereby greatly reducing the total insight of the crees there

Branchy feedback mouth of 1000, silectric service was Bracken the hast mouth of 1000, silectric service was the hast mouth of 1000, silectric service which the hast service silectric service placed the particular powerion placed in much service being known as the South London Lies, which extends alone miles from Welloric to London Sridge Formerly the pressing time of this trip was their year at tenmoy it is twosty-dree minution, and trisine run at tenmony is the service of the service service and solding-current trailey, and the motor circum and safety-current trailey, and the motor circum cancel safety-current trailey, and the motor circum cancel safety-current trailey, and the motor circum cancel safety-current trailey.

#### ELECTRICAL

A recent pross report states that a chain of wireless stations is to be established by the British Admirally in the Pacific Cosm. High-power stations will be placed at Sydney, Doubtless Bay, New Zealand, Sawa, the capital of the Fiji group, and Ocean island with medium-powered stations in the New Hobrides and Soloman islands

A saw dovice for connecting wires has just been put on the market it consists of a slewer adaption it over the wires, which is filled with a requisite amount of solder. The slewer is furnished with material which when ignited produces sufficient heat to melt the solder. The wires are then jammed together within the allows and firmly soldered in this position. The device radium should be a soldered in this position the device quires no torshor or soldering from, as the inflammable material can be ignited with a match. The advantages of such a system of connecting wires will be specially those who have tried to solder joints on overhead lines.

The voltage on power transmission lines has been study! Increasing, and at such a pare as to almost take one's breath a way. This development has required a similar advance in the design of transform est capable of laking the high-tension current and reducing it to a lower and more service-size voltage at the polita of distribution. The latest transform of the stype have a capacity of 37,30 kilovatias, of the stype have a capacity of 37,30 kilovatias, and capable of taking a maximum voltage of 113,800 and reading it to 12,100. Those transformers have been built for the Stanishaus Power Company of California Each transformer unit weights about 28 tons complete stands 17 feet high, and occupies in floor space of 5% to 15% or the stanishaus power has not appeared 5% to 15% or the stanishaus power Company of California Each transformer unit weights about 28 tons complete stands 17 feet high, and occupies in floor space of 5% to 15% or 15

For the past three years must has been cured by the intrivity in much less time than was required by the old method. The must is pilered in large wooder tanks and covered with the ordinary pikkle. An alter nating current of 35 amperes at 35 voits is passed through the vat, the alternations serving to prevent electrochemical action. Carbon electrodes are used, which are surrounded by province cups that dip into the brins. The coat of curing a vat full of must flow which are surrounded by province cups that dip into the brins. The coat of curing a vat full of must flow of the current is not perfectly understood but if appears to drive the pickle into the must and hasten cure. It also superar to preserve the pickle and pravent its distribution, except for the loss of in gredents taken up by the must

According to La Lamiero Electrique a new microphose has been constructed by Mesens. Carl Eneme and J. Kannar, of Holmstroem, Sweden, which will with stand a current of ten to fifteen anypere. The details of the instrument are not given out, owing to the fact that it has not yet been proticed by patients. The Swedish government rescutly connected several telephone lines, forming a line nearly insterent unsite wery clearly over that circuit, whereas with the of very clearly over that circuit, whereas with the of the control of the conversation has been curried on over a distance of 12 miles, using a high frequency current of six numpers

The Nerry Experience in civing its carnet support to the bill introduced by Mr. Roberta, who is a men too amateur wireless the property of the property of the control amateur wireless telegraphy. Mr. Roberta s measure calls for a board consisting of seven members, one expert each from the Nary, War, and Tressure telegraphy and telephone interests, and on scientist who is well versed in wireless telegraphy and telephone interests, and on scientist who is well versed in wireless telegraphy and telephone to the operations of the annateur telegraphers be confined to certain hours of the day, and that each operator be required to take out a license. The Nary Department has recently for warded to Mr. Roberts extract from the logs of errence cutters, showing some of the difficulties within axial which axial which as openious have to contend.

With characteristic thoroughness the Pressian Government Railway have been investigating the best readbed for their lines, also the best trulley systems and motors. About 30 miles from Berlin is an oval shaped experimental valiway of about a mile in length Part of the readbed consists of wooden ties, and an other part of metal ties. Various kinds of ballast are used, and various methods of connecting the rails and ties. Over this experimental railway an electric trail is operated every weeking for about sweaty hours of the day, and in this way it is possible to determine which form of readbed will best stand the wear of actual service. The overhead system has been changed from time to time, and did stand the wear of actual service. The overhead system has been changed have been used. The overhead system has been changed that the stand the wear of actual service. The overhead system has been changed to the stand the way of the stand the stand the way of the way of the stand the way of the way of the stand the way of the way of the stand the way of the stand the way of the w

#### SCIENCE

A moving picture operator was taken up by Latham receilly on a seven minute trip, at an elevation of eighty feet from the ground if to took pictures with the lens pointing downward. The apparatus weighed 300 pounds, and its operator 186

These secus to be some evidence that pulsatory oscilitations of the earth a creat increase where there is a strong harcmetric gradient, without was where there is a strong harcmetric gradient, without we will be the the wind. The phenomenon has been investigated to two Japanese scientists, one of whom, Omort, has shown that the earths pulsations are due to thanges in the pressures upon the earths a creat caused by baremetric changes or by accompanying changes in the sea level, but not due to the wind itself Shitmon, to sea level, but not due to the wind itself Shitmon as a larguages, has carried on Omoria observations are Japanese, has carried on Omoria observations are Japanese, has carried on Omoria observations are presented to the strong of the comtained of the strong of the composition of the obtained records of pulsations with composite of the obtained records of pulsations with composite of the ob-

The blanket effect of clouds, thir power of conserving terrostrial temperatures, is discussed by Mr W with the conservation of the Monthly Weather Review. He says that this blanket effect of clouds as the tother high emilactivity for radiations emitted by the exist and hinner to their high efficiency as heat radjators. A black body should have no reducting power and be opaque. Water reflects only from 2 to the save revealed, and a layer 1 cent for the waver revealed, and a layer 1 cent for the saver than 1 for an existence of the saver layer than 1 for a first red. The earth a maximum emission of a millimeter thickness or save layer than 1 for the third red. The centre is the same region of a and loss than 1 millimeter thickness of the save that the save than 1 millimeter thickness of the save that the

The troning of lines may have a greater effect than is expected of 1. As the temperature of the from may granly exceed 366 deg F II has been inspect and the provas of froning may smiller to intertile surgical dressings and honce he of valuable scrive, especially in rural districts and closewher in the absence of the infections over a smill surgical forwards of the surgical surgical forwards of the surgical surgica

Prof. Joly has studied the radioactive properties of the many leave sepecially too of Yourview. From his results it appears that the Vesuvian his, reduce 1811 to the present day, are remarkably rich in reduce compared with other leaves, the values ranging up to three times the normal for ligousus recks, and sometimes von higher than that The thorium content, although large in comparison with what generally prevails in the rocks of the 88 Gothard series, is not considered in the rocks of the 88 Gothard series, is not considered in the rocks of the 88 Gothard series, is not considered in the rocks of the 18 Gothard series, is not considered in the rocks of the 18 Gothard series, is not considered in the rocks of the 18 Gothard series, is not considered in the rocks of the 18 Gothard series, is not considered in the rocks of the 18 Gothard series of the rocks of the 18 Gothard series in the rocks of the 18 Gothard series of the 18 Gothard series in the 18 Gothard series of the 18 Gothard series in the 18 Gothard series of the 18 Gothard series in the 18 Goth

Not so long ago Prof Turner proved that gold lost becomes transparent when based in contact with glass. This interesting phenomenon has been further studied by Mesers J. C. Chapman and H. L. Port without the use of glass. In their experiments a piece of gold leaf was hold by its edges to a platinous loop of gold leaf was held by its edges to a platinous loop becames on great that the leaf tore in places. Hence at a sufficiently high temperature gold leaf contracts. On assuming it interescopically after removal its structure appeared to be decidedly more granular Substitute of the superature was a superature when the substitute of the





46

### THE MOTOR CAR AND THE ROAD.

THE DESTRUCTIVE EFFECT OF HIGH SPEED.

BY LOGAN WALLER PAGE

DIRECTOR OF THE OFFICE OF PUBLIC ROADS, UNITED STATES DEPARTMENT OF AGRICULTURE.



The most serious and difficult problem now compatine the attention of highway engineers all over the world is the preservation of the crushed stone road under the destructure action of motor vehicles, and the deviating of new methods of construction adapted to the requirements of this twentieth, ensuring trade. That the automable has transitionally no one with contraction of the United States, and the number is

and the fron-tired wheels passing over the road from time to time were depended upon tow are of a sufficient amount of rock dust to replace that carried away by whol and water, and this, under the action of moleture, recommend, thereby automatically renewing the bond of the road surface. When the road was subjected to drough, the conditions were made normal by regular aprinkling. With the advent of the automable, a totally new condition pressis. The rubberble, a totally new condition pressis. The rubberthe effect were produced by suction or vacuum, the action of both front and rear wheels should be somewhat similar at least. It seems apparent to the writer, therefore, that the read best adapted to motor traffic in the road which will best resist this powerful tractive shear. It has already been demonstrated that no plain meandam road fa capable of resisting this vacuum of the plain meandam road fa capable of resisting this forestime.

While the destruction of the road may be considered as the most tangible and serious problem, the dust







Twenty miles an hour.

irty miles an hour

THE DISINTEGRATISG RYPECT OF AN AUTOMOBILE TRAVELING OF AN ORDINARY MACADAM ROAD AT DIFFERENT SPEEDS.

increasing at a marvelous rate. In Prance, which is credited with shwing the most superb system of roads in the world, built at a cost of about \$825,000000, a great International Road Congress was sanctioned by the Pranch government and held at Paris in October, 1988. Bo alarming were the ravage extuned by motor pose of the meeting was announced to be "The Adaption of Roads to Modern Methods of Loosomician" in the United States, the problem as yet is a vital one only near the great venture of population, for the resont that but a small percentage of the total mineage or reads its improved, and the motor tradic is largely concade in improved, and the motor tradic is largely conceasing use of the automobile of the successing was of the automobile.

The fact that must give us concern is that the old methods of construction which have stood every test for more than a hundred years are inadequate to most the conditions of this new form of traffic, and that we are in the midst of a transition period which may exentually revolutionize the science and art of the road eventually revolutionize the science and art of the road what is to be expected as the property of the road what is the exact cause of the injury, and finally to devise an adequate remedy
Whese Trèsucyct, the great Prench esgineer, made his

When Treasquet, the great French engineer, made his report to the Council of Bridges and Roads in 1716, he set forth the principles of construction which, as modified and added to by John L. MacAdam in the early part of the nineteenth century. These proven adequate until the twentisth century. These great road capable of withstanding the wear of iron-tired horse-frawa vahicles, for the motor-driven vehicle had no place in their philosophy. They worked upon the theory that the dust abraded from the crushed stone would full the voids between the angular fragments and when set would serve as a cement, thereby making the road surface practically a monolith. The tron-shot horses

tired whosls moving at accessive speed fall to predoce any new dust from the rock, but the tremendous abserring effect of the driving wheels forces the loose dust on the road fato the air in great clouds, and, as the body of the machine displaces a large volume of air, the deflected currents carry the rock dust off the road, thereby effecting a permanent loss of the air, the contract of the cont

Highway and mechanical engineers have given much study to the action of the automobile on the road surface, and many ingentious theories have been advanced. While it is true that the slipping of the tire, the skidding, the shape of the car body, and the succioes of the peacematic tires all contribute to produce the effect, the most conclusive experiments seem to warrant the assertion that the great tractive force or nhear courted by the driving wheals of motor cars is the main factor tollury a Areire of itself conducted by the United of their of the contribute of

nuisance as intensified by motor traffic is most farreaching in its indirect effect. It has been claimed that intertential the intertent of the dust produced by man comes from streets and highways and someone has very apity termed the public road the "national dust factory." The effect of the hage clouds of dust upon health must be very great, as most forms of disease to cross growing adjacent to the public highway through the dust nuisance is real and tangible, and particularly is this true of small fruits. So extreme has this condition become in certain districts that no attempt is made to raise fruit near dusty roads. Its effect upon some classes of live stock is most severe, cuttle and horses in particular being susceptible to the germs of tuberculosis carried by the dust. The authmobilic cannot be half responsible for these forms of mobile cannot be half responsible for these forms of treatment which might be considered a pallistive.

treatment which might be considered a pallative. The efforts of progressive bighway engineers are directed, therefore, primarily toward the preservation of ourcor stone-surfaced roads and the construction of dustions of the effect of the effect of the effect of the the dust nuisance. The results so he occupantly the there is no effect of the effect of the effect of the there is no effect of the effect of the effect of the state of the effect of the effect of the effect of the state of the effect of the effect of the effect of the state of the effect of the effect of the effect of the state of the effect of the effect of the effect of the state of the effect of the effect of the effect of the effect of the state of the effect of the effect of the effect of the effect of the state of the effect of t

It is evident from even the slightest consideration of the subject that the solution of the problem must come, for the most part, from the highway engineer rather than the autonosible manufacturer and the legislator Manufacturers have, to some extent, tried to reduce the dust crasking tosseem, of their machines by various mechanical devices. Experiments in Engiand Prought out the fact that care raided with bottles having the contract of the contract of the contract of dust than those with an average clearance. Some novel duries wave triple with more or less smoons, the



SPRINKLING TAR ON A ROAD AT SAUGHS, TRANS.



WASSET FOR PERSONS SUPPLY SUPPLY A SALE.



market his Aire against

#### Scientific American

JANUARY 15, 1910.

Defer results being obtained from a car with a fast steel bottom overlapping the sides of the our, and shoes instead of med guarda. The sides cores was attached from the ground and projected beyond the redistor. The sides of the output of the property of the property of the core of the sides of th



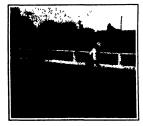
CONSTRUCTION OF BITUMINOUS MACADAM ROAD BY PRESTRATION OR GROUPING METHOD. MEANY TAR IS APPLIED ON THE TOP OCCURATION STORE

a binder more powerful than the rock du For the purpose of presenting intelligently the experiments thus far conducted with special binders, the term dust preventives' has been applied to all of the various bind ers having for their object either the sup preasion or the prevention of dust. These may be divided into two classes, temporary and permanent The temporary binders sorre morely as pallistives and require fre-quent renewal, the permanent binders, so called, enter into the structure of the read as a constituent element, and are either in corporated with the other materials at the time of the construction or applied later by face treatment

In the class of temporary binders may be included water, salt solutions, light oils and tars, and oil and tar emulsions, while the (Continued on page 67)



MINING A BATCH OF MATERIAL OFF THE ROAD BY RAND MACRINE.



RITURINOUS RINDER APPLIED WITH BROOMS FROM STREE WHERLBARROWS.



TARRED STONE DELIVERED ON THE ROAD OF PREVIOUSLY COATED WORK



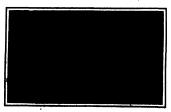
MAND MINING OF BITTWINGTS RINDRE ON THE ROAD.



MITTE CONCRETE MIXER USED FOR MIXING ROAD-MAKING MATERIAL.



AN ORIGINAL LEMON MAND AN UNIONIOWN, ALA.



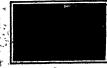
APPLYING SPECIAL TAX RUPER AT WESTWOOD, HAM.



SUBGRADE COURSE BEFORE ROLLING



HARDEN TO COMMISSION OF A SERVICE SALE OFFICE AND ASSESSED APPEARANT FAIR, PRINCEPPERA, SELECT AND SERVICE SALES SELECT AND SELECT AND SERVICE SALES SELECT AND SELECT





APPLYING A STEAL GOAT OF TAR TO A BOAD BUILT REPROTALLY FOR MISH-SPEED AUTOMOBILE TRAFFIG.

### MOTOR BALLOON GUNS.

AUTOMOBILE VS. AIRSHIP



It is to their credit that the manufacturers of arfillery should so earnestly have grappled with the new probl problems presented by the development of successful aeroplane and dirigible balloons and so quickly have designed special ordinance to meet the new form of warfare. The firm which has been most active in this direction is the great Krupp Company, in having brought out several types of gun, capable of firing at the high angles which will be necessary in order to hit the rapidly moving airships and planes of the future. Because of the extreme mobility of the new

method of attack from the sury that the means adopted to resist it shall be capable of a correspond ing mobility This is especially true where the warfare is likely to be car ried on against more or less rapidly moving bodies

Now the automobile be ause of its speed weight, and strength, is particu larly adapted, not only for carrying light automatic guns but for affording a platform from which they my be fired with a res sonable degree of ac-curacy Indeed the artilmotor (ar armorlery plated and carrying a gun that is locked firmly to its chassis, is the natural counterpart of the familiar armored train run ning on the rails of the

regular steam railroad And although the military automobile will be largely restricted to the reads, and will leave them only under exceptional conditions of amooth and fairly level country, the automobile balon gun will find a field of usefulness in future cam-

paigns whose limits can only be determined by the hard experiences of a regular campaign. Of the three rapid firegum motor cars herewith shown, one is American and the other two are of German make One of our illustrations shows a rapid fire balloon gun, mounted on an armored motor car of 60 horse-power. The latter, in spite of its weight of three and a quarter tons, is capable of making a speed of 45 kilometers per hour and mounting grades of 22 per cent, even when the roads are of poor quality The gun is also shown mounted on a semi-armored can This effective weapon has a muszle energy of 248 This emetities weapon has a music energy or 24% meter ions and an extreme range at an angle of 48 degrees of 7,800 meters. At the maximum elevation of the gun, the shell has a maximum height of trajectory of 7,800 meters.

oring of the motor cars consists of nickel steel plates, 3 millimeters in thickness, and the gun itself is provided with a special shield capable of a wide are of aiming The wheels, also, are con

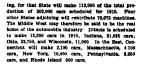
in with nicket steel plating The ammunition ۱. carried in a box underneath the will be noted that the front of the car is provided with silts for

The guns are provided with shells of a special design, suit ing the gas bag of a dirigible or the canvas or rubber-cloth cov ered surfaces of an aeroplane To the flight of the shells, they are furnished, at the base, with a smoke - producing anterance which

instant of firing the gun, and emits a distinct trail of amoke during the flight of the shell. This gives the gunner some indication of the error in his sighting. But it will be a very difficult matter to score upon

a fast flying machine speeding mile-high above the earth. The most promising form of attack is with mel, which, if burst at the right distance in front of the object, will envelop it in a perfect spray of jagged shell fragments

Another illustration shows the McClean matic rapid-fire gun, as mounted on a 3-ton Packard



These figures are taken from statistics obtainable

in connection with eighty of the prominent auto-mobile companies, and are startling to may the least, both as to their bearing on the location of the motor car industry, and or the importance of the au tomobile industry as a whole In addition, it whole In addition, it must be remembered that there are fifty other firms making 100 cars or less with 150 makers turn ing out a few cars or experimenting

Just why the middle West should lead in motor car manufacture is worthy of some consideration, especially when it is re-membered that much of the early experimenting in motor cars and early manufacturing was done at plants in Buffalo and Tarrytown, N Y, Ma

N J, Bridgeport and Hart ford, Conn , Philadelphia, Pa , and other Eastern States. Because of the tremendous growth of the industry in the past tet years, and the amount of capital and num ber of people employed, the settlement of an industry like that of automobile making in any particular sec-tion of the country, is a condition worthy of thought. The middle West may be said to be in control of the situation, not alone in the making of cars, but in the making of tires, parts, and accessories. For this condition, we must first give credit to the industrial enter-prise of the middle West, for the securing of big facprise or the middle west, for the securing of big fac-tories, for the enterprising methods of its boards of trade, and for the readiness to contribute money toward the securing of new industrial enterprises, like that of motor-car building. Next must be considered the labor situation, which is excellent in the middle st, especially in the matter of hands for automatic machinery Most of the big machinery making com-panies are in Ohio or Indiana, where machinists of excellent character are to be had in large numbers.

sides being the center of the machinery trade, the Besides being the center of the machinery trace, the middle West has been the headquarters for raw ma-terial to a very large extent, at least after it has been put through its first or second precess, as in the case of rubber, steel, leather wood, brass, and other things

used in the mod

ern motor car More important than all is dle West is the center for transportation, a most important it s m when the matter of freight on au tomobiles is con sidered. Because of their high value, automobiles contribute very henvily to the and the matter of freight care for an extre on means an add of cost, which ev-ery manufacturer tries, to avoid. While it is true (Continued on



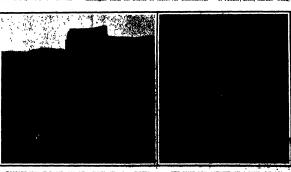
HEAVY MODERN-LIMAGE AUTOMATIC OUR HOUSTED ON A PACKARD S-TON TRUCK.

truck, for tests which were carried out inst year at Cleveland, Ohio. Lieut-Coi O W Lissack, of the Ordnance Department of the United States army, and McClean, designer of the gun, had charge of the tests, being assisted by the Standard Automobile Company, the Cleveland dealer cars and trucks.

The gun fired 3-pound shots at the rate of 100 p minute, the range being 35, miles. Shots were tried with the brakes of the car set, and also released When the brakes were set the truck did not move, and when the brakes were set the truck and not move, and no shock was felt by those surrounding the gun on the truck platform. With the brakes released there was a slight movement on the recoil, but no shock. The designer of the gun recommends its use on a truck such as the Packard, but armored for war

We hope to publish additional information regarding the results of additional trials of this gun, which are being made at Sandy Hook and Springfield for the army, and at Indian Head for the navy

The Middle West and the Automobile Indu Michigan leads all States in motor-car manufactur-



BALLOGE-ATTAGE RAPID FIRE GUN, WITH SEIELD, MOUNTED ON COMPLETELY ARRORD CAR. WEIGHT SX TORS.

THE SAME OUR ROTHERS OF A SERVICE MAY.

#### RIDE DEVICES ANTI JOY

#### BY HARRY WILKIN PERRY.

So great a proportion of the many fatal or otherwise very serious automobile accidents chronicled almost daily during the motoring season is the result of the use of cars without the owners' knowledge or consent, the general equipment of auton with some means whereby the unauthorized use of ma

positively pre vented If mat-ters continue as they have, it will become in embent on ev ery law-abiding and gentlemanly owner of an automobile to adopt voluntar tive measure, compelling it are not enacted for the public

welfare "Joy riding" as the wild run ning of a motor car by a partially inebriated driver accom panied by sever-al hilarious comcome to be call ed in the automobile vernacu lar -- is of sev eral kinds It may be indulged in by the lawful owner or machine, by skylarkers pass-ing through the streets and find ing an unatter ed automobile standing by the curb which can and by chauf feurs employed by the owner or by employees of the public gacar is kept, who take it out, usu ally at night, without the owner's or the garage pro prietor's know!

Laws have existed for some years in a number of States making it a misdemeanor for anyone to meddle with an au-tomobile standing in the street, and prohibiting users of motor ing their ma-

of with the engive riming. During the past winter there has been
much activity in legitality circles for the epactment
of laws to present 'gor riding.' The New York Legis
lature passed a hill containing a provision prohibition
aryone from using or tampering with a motor valuel
without the owner's consent, under panulty of a fina,
maynetaments, or deprivation of the right to use the
majoratements, or deprivation of the right to use the
content of the content of the right to use the
final transfer of the right of the particular
tion. The Chiromac Langinesis passed a Milli og passe,
na "In the opinion of the Oscard Assembly an emergency stativit," devaluthing any priving from immerging
with or centring or stayling any motor car without the

knowledge and consent of the owner or owners, whether an individual or a corporation, and fixing the penalties for infraction at a fine of not less than \$50 nor more than \$300 or imprisonment for not less than 30 days nor more than 90 days or both such fine and

Such laws will doubtless have a deterrent effect, but

in the way of producing a device that will act as a certain check on the use of the car and yet enable the chauffeur or the mechanic to clean and adjust the en gine, test the ignition and generally keep the car "tuned up" to maximum working efficiency are numer ous and complex Chauffeurs and machinists are clever and resourceful or they are unworthy of their

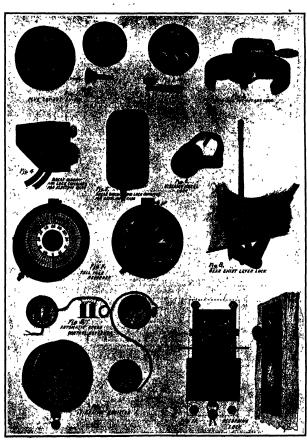
A Dail, hire screw, or piece of wire can be made often to take the place of a removable switch plug or or spurgear that drives the flexible shaft a recording in strument can be disconnected Again, if operating part of the motor car is positively locked against action, such as the wheels. steering gear, or transmission it may be diffi cult to move the tuachine rage, as fre quently becom necessary for washing repair ing, or in event of a fire when have to be hur riedly pushed into the street vices that have been invented of affording p tial or complete protection to the owner against the unauthor speeding of his speeding of his car may be di vided into groups as fol lows

1 Devices to prevent the on gine from being the car is left standing in the street embracstreet ing (A) ignition switches with removable con tact plugs (B) es that can be locked in inop

erative position 2 Devices to lock essential operative parts, embracing (A) ateuring wheel lock and (B) speed change lever lock

3 Speed lim iting devices, embracing (A) instruments intercon necied with a speedometer and the spark or throttle control so that a given speed cannot be exceeded, (B) congress so thus a given speed cannot be second, [18] and bible signals sounded automatically when a pre-determined speed is attained, and (C) speed indicat-ing devices with large disis prominently placed so that they can be read at a distance by policemen and

others
4 Vehicle movement recording devices embracing
(A) vibration recording instruments of the ps dometer
type, and (B) clockwork registers in which permanent
records of the time, extent and rate of movement are (continued on page 58)



ARTI JOY RIDE DEVICES

they are difficult of enforce sent and are punitive they are difficult of enforcement and are punitive righter than preventive, applying the punishment after the evil has been committed. The abuse of automo-biles as distinguished from their proper and most de-strable use has reached such perious proportions as to call for the general application of machanical and autocall for the general application of machanical and auto-matic means whereby the unauthorised use of a ma-chine can be positively prevented or detected the first, time it occurs and the punishment made to follow, swiftly upon its commission

inventure have wrestled with this problem for several years, and a variety of devices have been put on the market to fulfill the desired ends. The difficulties

### WHAT THE MOTOR VEHICLE IS DOING FOR THE FARMER.

BY WALTER LANGFORD

Less than five years ago farmers generally looked upon the automobile with bitterness and condemned it as a "toy of the rich" Today, there are farms com prising hundreds and even thousands of acres, on which nearly all of the heaviest work is done by motor vehicles. There is hardly any part of farm work that cannot be done more quickly and with greater satisluxury and time-saving ability of the motor car He balances off the cost of a tenth or a twentieth of a gallon of gasoline per mile traveled against a third or gamin of gasonine per mile traveled against a titlet of half bushel of outs a day at 65 cents a bushel, whether the horse is working or is standing in the stall on a rainy or a winter day, and reckons the time saved to himself as mainly pure gain reau, high clearance above the road, a theroughly pro-tected engine and transmission, reasonable price and low fuel consumption and maintenance cost have con-tributed toward making this model popular with the rural buyers. From the statements of hundreds of users, it is found that the average cost of upkeep is than two-thirds that of keeping a horse. The



CARRYING CHATED CRICKERS AND EGGS TO MARKET

faction by the use of motor power-cither applied to a self moving machine or in the stationary form— than with horsefiesh. Whether it is making a quick trip to town with a load of butter, eggs, fruit, or vege-tables, to the creamery with the evenings cans of fresh utils, to church with the family on Habbath morning, doing the spring and fail plowing, cultivat ing, resping threshing—the motor vehicle in its varied forms has become the latest ally of the progressive prosperous farmer

It has been a matter of general knowledge and com mon comment in automobile circles that extraordinary mon comment in automobile circles that extraordinary numbers of motor cars have been going into the ro-note sections of Kansas, Nebrasks, Minnesota, the Dakotas, Colorado, and even Montana Oklahoma, and Tarsas during the past season. The statement has been made by a man identified with the trade and med to be posted that fully one-quarter of the purchases of motor cars west of the Mississippi dur-ing the season of 1909 were made by farmers, and this means a good many when the combined output of the manufacturers of the country for the year ag gregated in the neighborhood of 75,000 machines Bonne of the little communities in the Middle West, with a population numbering only hundreds or at most a few thousand inhabitants have begun to boast of ing more motor cars in proportion to populapeaseasing more motor cars in proportion to popular tion than any other city or town in the country, and to prove it, they congregate all the cars in the village in Main Street and have a group photograph taken. The farmer, who has long distances to go for every-

thing, from a keg of nails to a paper of tobacco, and who works early and late to make up time lost partly in going "to town, has not been slow to appreciate the Scattered all the way from the Atlantic to the Pa-cific coasts there are small 'ruit and vegetable grow-ers, dairy farmers and poultry raisers who make a daily practice of carrying light loads of produce to market in the tonneau or on the rear deck of ordinary light touring cars. They can leave the horses to work in the field and can make the trip in a third or quar-ter of the time formerly consumed thereby gaining just that much additional time to be devoted to more work or to reading visiting, attendance at concerts

The ordinary four or five-passenger touring car of The ordinary four or five-passenger touring, ear of moderate power and reasonable price is most extensively used by farmers. Some of the accompanying illustrations show how such a car is put to practical uses on the farm with the rest next removed. This is the general utility automobile of the agricultural sections and is used for a great variety of purposes within it he farmer drives out to his grain field to experiorated the threshing, runs down to the pasture with a reel of wire to repair the fence, runs into town ded, carries cans of milk to the creamery or crates

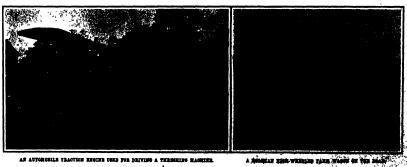
mended, carries cans of milk to the creamery or crates of live positry to the sepress of the control of the con

farmer of to-day is well informed regarding the me chanteal features that adapt an automobile to his re-quirements and is a careful buyer. He can safely carry 500 pounds on the rear of a 20-horse-power car and can drive ten miles to town in from half to three-

and can drive ten miles to town in from half to three-quarters of an hour with the load.
Largely as a rount also of the farmers' demands there has been developed during the last three or four years a type of motor car called the high-wheeled buggy. There are upward of fity companies in the country now actively engaged in building this strict or motor car separatily for use to country datasets where the roads are rough, hilly, and, according to very low in prior, simple in construction and opera-tion, and answer the purposes of many rural dwellers very well. They use only about a galloon of guestion to fifteen or twenty miles traveled, and a set of na-row solid tires, counting say 184, will wear a year or to fitteen of twenty names traveled, and a re-row solid tires, costing say \$25, will wear a year or more with no expense for repair of punctures or blow-

Within a year or two there has be Within a year or two there has been added to the two-passenger runabout and four-passenger surrey models a high-wheel open-bed light delivery wagon model, of the democrat wagon type, especially suited to farmers' use. A lead of 550 to 800 pounds can be carried in the game beneath and bark of the front seat, and its some makes as extra double seat can be set in the back to scommodate extra passengers when the the back to accommodate extra passengers vehicle is to be used as a passenger convayan

vehicle is to be used as a passenger convayance. Other light work wagons with open-bed bodies par-ticularly suited for agricultural uses but fitted with longer bodies and having a load capacity of 1,000 pounds or more and costing \$1,000 and upward, are



AS AUTOMOBILE TRACTION REGINE USED FOR DRIVING A THRESHUSE MACRICIA.

#### Scientific American

manufactured by several companies in Chicago, Syra-cuse, Efgin, III., Dowagiac, Mich., and Littis, Pa. They are excellently suited to carrying to market good sized loads of vegetables, fruit, dairy and barnyard produce weighing from 1,000 to 2,000 pounds, and for hauling back loads of feed, fortilizer, feacing and building materials, farm machinery, and so on The

high wheels give the axiss and drivmechanism a good road clearance, the construction is of a heavy rable as well as simp

Numerous cases might be given of motor cars put to special service in connection with farming. In Maryland there is a high-class dairy farm where motor delivery wagons are used altogether to distribute milk among consumers in the vicinity, and in Indianapolis a large milk company is using a 14-ton and a 3-ton graciine using a 14-con and a s-on gasonne truck in the collection of milk from dairy farms within a radius of twesty-five miles of the city, which was formerly shipped by the interurban electric railways or by horse and wagon. In England a large produce grower sends his fresh vegetables to market in a huge motor van, the roof and tailboard of which, as well as the inside, are piled with green goods These examples seem to foreshadow the time, not very distant, perhaps, when farmers will find it cheaper and more convenient to ship all of their farm products to market on motor trucks than to haul them with horses and wagons. Possibly the trucks will be owned by local express companies organized for the purpose, which will charge a reasonable price for haulage.

so that it will pay the farmer better to keep his horses—if he needs any then—at work in the field, and he will not need to invest any capital in the motor trucks. Doubtless some of the transporting companies will use motor tractors, which will run over regular routes every tractors, which will run over regular routes every morning and pick up a string of farm wagons loaded with produce, hasling them to market and back again for a fixed charge. A single tractor should be able to haul four or five such wagons over good roads. In Connection a three-ion truck is regularly used for hasling grain and carrying all sorts of farm sup-ples and products for a 1,260-eer farm. This is one

for nauling grain and carrying all sorts of farm sup-plies and products for a 1,300-acro farm. This is one of the many fancy estates conducted in the East by wealthy owners largely as a personal hobby yet at the same time as a profitable investment. The truck represents an outlay of \$5,000 and is kept in a spe-cial garage for work motor vehicles which are to be

sed extensively on the farm A ranch of several thousand acres in Montana is conducted entirely without horses, the plowing, sow ing, cultivating, reaping, threehing, and hauling of the grain to the railroad being done by motor tractors and grain to the railroad being done by motor tractors and motor waggons. We have had the horseless sirect car for twenty years, the 'horseless carriage" for ten, and now we have the horseless farm. May we hope some day for the horseless city?

any for the norminess city. While the foregoing examples are isolated cases and apply to farming on an extensive scale with ample capital, they point to great possibilities for the future use of self-propelled vehicles in farm work, utilizing exactine kerosene or densitured alcohol as fuel The farmer with a small acreage who would not be justi fied in buying a motor tractor for his own use, will be able to hire his plowing and threshing done by com-panies operating motor tractors, as for many years he has had his threshing done by itinerant steam threshing outfits. And, incidentally, the work will be done cheaper, there will be no danger of fire from flying sparks, there will be little or no water to haul, and there will be fewer men to feed

In this country, as well as in England and France, there are large companies that make a specialty of



AN AVERY PARM TRUCK HAULING SCRAP.

building small farm tractors for universal tractive and stationary power work A company in Minneapolis makes an 8 horse-power tractor weighing 5 500 pounds for such work as operating hay presses corn shellers etc and for drawing wagnos and portable machines of this class on the road In York Pa. is another large company that makes motor tractors and trac nes in ten sizes, from 1,000 to 35,000 pour in weight. The smallest is rated at 1½ to 2 horse-power and is intended for all sorts of farm work such as hauling the stone-boat, churning pumping feed cutting, etc.

rican motor tractors used for plowing and threshing usually develop from 12 to 35 horse p and weigh from 5 000 to 20 000 pounds They gang plows turning from two to eight furrows gang plows turning from two to eight furrows at a time One of these—a 15-horse-power tractor built by the largest harvesting machinery com-pany in the world—plowed 10% acres of "gumbo soil with a three-furrow 12-inch bottom plow in

an hour and a quarter on a consumption of 1½ gallons of gasoline per acre at an international competition held in Winnipeg last July A "wagon fractor, built in Peoris by a great agricultural implament works for general utility

cents an acre for fuel. In a ten-hour day  $7\frac{1}{2}$  acres could be plowed for about \$3.25, not including labor. This wagon tractor is a very interesting vehicle it was designed particularly for farm purposes by mer who are familiar with the peculiar requirements, an nts, and bines in one machine a truck for carrying load

its own body, a tractor for drawing plows and other farm machinery, and a power plant for driving threshing machines hay balers and other stationary ma chinery by belt It will take the place of several teams and wagons on the farm

Nowadays, on the farm as well as in the manufactory it is necessary to do the largest amount of work in the short est time in order to make an under taking successful. This is recognized e progressive farmer and farm machinery builders and to a large ex-tent the advantages of the motor car and motor tractor are appreciated by builders of farm wagons and bugg Most of the leaders in these fields are now offering their customers a motor buggy, a motor car, a motor wagon, OF 8 motor tractor

#### The Modern Ricciric Antomobile BY MAIN GROENFELDT M S. M.S.

The heavy cumbersome electric cab or broughan of carlier days has cleared the field for the light run-about victoria or interior driven coupé Less weight means more speed and a greater mileage radius it was looked upon as a great per formance when one of the earlier types of electric automobiles traveled forty miles on a single charge of the buttry at a comparatively low speed
The modern electric automobile will
negotiate about twice the distance at
a much greater speed. The most vital components of
an electric automobile are the motor and controller.

two parts which are of different design on about every For its various advantages the serieswound motor has outclessed its livel of the earlier days, the compound motor. The writes wound motor, if properly designed will do its work for three hundred and the first first hundred and the first firs dred and sixty five days in the year without requiring any attention attention. The most desirable motor is not that th tends to drive a car up a hill at a comparatively high speed. A heavy battery discharge is thus en which is of course very detrimental to the bat tery Of two cars traveling at the same speed on the level, that one will travel the faster on a grade whose controller was not changed. The motor of this faster



DROK THE PASTURE PRICE IS OUICELY REPAIRED.

car is designed for a smaller increase of torque in proportion to the decrease of the speed. Even if this difference in speed is speed size it this difference in speed is very small say one-half mile an hour the faster car will have to pay dearly for it in current as well as in decrease of mile age radius and in battery wear The go He will designer will find a middle way strive for the highest battery efficiency

tast electric, as the power is unlimited for a short distance. The art is to apply the power at disposal in the most all-around estiffactory way and to design a carriage which is reliable and cheap to maintain.

In the line of various controllers the drum type for good reasons seems to have grown into great favor The various speed changes can be obtained without arcing or burning, and a gradual increase of speed is effected from step to step with a small increase of (Continued on page 68)

MALF A DOREST CANS OF MILE ARE TAKEN TO THE GREAKERY AND SPERMENTAL STREETS STREETS ASSOCIA

the road, was tested at the same trials. Coupled to a two-furrow 14-inch gang plow, it turned ever 106 acres in 1 hour 25 min-utes on a consumption equivalent to 386 gallons

THE REPTY CARS BROD

s in the field and on

### THE MODERN LOW-PRICED CAR.

#### BY JOSEPH ROGERS.

The automobile buyer faces no such questions in 1910 as confronted him a few years ago, when all that was expected of a car was that it would run. At that was expected of a car was that it would run. At that time the gasoline engine was not understood as the time the gasoline cignite was not understood as the engineer understands it to-day and all of the parts and appurlenances were undergoing a process of evolution that resulted in said differences between the models of two sun cressity years. Each make had some peculiar-ity of dwign, and the actection of a car was compil-cated by the difficulty of getting definite information on performance

There were reliable cars, of course, but their initial There were remove cars, or course, but their initial cost and the supense of operation made their ownership possible only to the very well to-do. The car that could be bought by the man of moderate income re-quired close attention and the adjustments and repairs that were a constant necessity left him little time for anything clse. If these were in the hands of a repair man the monthly bills were out of all proor a repair man me moutary ones over out or an pro-portion to the mileage covered and the pleasure ob-tained. Automobiling at that time was unquestionably a diversion for the rish, and it is popularly supposed that such is still the case, but as a matter of fact, the man of moderate income can to-day pure lasse and use a rar at an exprese that is well within the bounds of

The primary cause for this is found in the relatively close understanding of engine and car design that obtains to-day. The systematic experimental work that has been carried on in the large factories has resulted nas seem tarried on in the large factories has resulted in a refinement in design and an approach to a stand and that place automobile manufacturing on as eco-nomical a basis as is possible in the production of any other mechanism

any other mechanism

The moderate price at which an automobile may be bought is not due to the use of poor material and cheap labor, on the contrary, the low priced car of to-day is better in quality than the highest grade cars. of six years are

in the early days of the automobile industry the manufacturer was under the necessity of making all of the parts, to-day, the factories actually making even 75 per cent of the parts that they use are in small proportion to the number of producers. A few years ago, when a manufacturer purchased his engines, change ced gears or other parts, he concealed the fact, to day, a constantly increasing number of firms make it no secret that their cars are assembled in whole or in part. It is to these changes in policy that the excellence of the medium priced automobile is largely

The manufacturer of a complete car is under the necessity of maintaining an experimental department in which he can try out suggested improvements on all parts of the chassis This is expensive work, and a proportion of the cost of the department must be ina proportion of me cost of the department must be in-cluded in the price of every car sold. The maker of an assembled car is under no such handleap, for each of the firms with which he does business will carry of the firms with which he dows business will carry on only such experimental work as in required for its special line, and the expense is borne by so great an output that the individual proportion is negligible. There was a time when an assembled car was un-

doubtedly open to suspicion, for however desirous makers of its parts might be to do good work they had neither the knowledge nor the facilities that would reake it possible. These same companies now possess normous plants, their designers and equipm the best obtainable, and their products embody the intest and best in practice material and workmanship. Assemblers thus have parts at their command that are of a high degree of excellence, and can buy them at prices that are far below what was charged for the

prices that are tar octow what was charged for the weak and faulty product of former years. The low prices at which assembled cars can profit-ably be sold have forced the builders of cars of com-peting grades to manufacture on a very large scale, in order to bring down costs through economies pos-sible only with quantity production. Such a firm equips its factory with jigs and special tools for every no order that calls for even a slight deviation from he standard specifications.

When a manufacturer turns out twenty thousand

cars a year, it is not only justifiable but n him to invest very considerable sums in special mahim to lawed very considerable sums in special ma-chiery of all kinds that for a smaller output would be inadvisable One manufacturer has spent \$46,000 for diss to produce a rear acts tousing, on a produc-tion of one thousand ears, the charge against cach for this would be \$400. With an output of twenty thou-and cars, however, but be charge of \$3 against each is little stought for the purchaser to pay for so excellent

A recent development that illustrates the dideavor

to reduce manufacturing costs is the establishment by some of the leading producers of assembling shops at the large centers. To these are shipped parts in suffi cient quantity to build the cars required for that locent quantity to build the cars required roy tast io-cality, and as there is no equipment of machine tools, the expense is slight. The freight rate on unassem-bled parts is much lower than on complete cars, and the saving effected in time and convenience as well as

in money makes the system a satisfactory one However it may have been in the past the present day manufacturer of moderate-priced cars makes no e than a legitimate profit ducers stated recently that his profit on a \$1,000 car is less than \$100, this is not excessive when one con-siders his cormous investment in material and parts, his really vast equipment of machine tools, and his labor expense

It has been said that any average engineer can de sign a car to sell at \$4 000, but that the greatest skill and a car to see at \$ 9000, but that the gracest skin is necessary when the selling price is to be less than \$1000. However that may be, the medium and low priced cars on the market show exceedingly clover designing and bear every indication of the highest grade of mechanical engineering Being light in weight, the material entering into their construction is selected with the greatest care, and it is typical of the automobile industry that many of the alloy steels in common use were hardly more than laboratory curl

The whole tendency of design is to reduce weight and machinery and assembling costs, but it is rare to see a case where strength and durability have been sacrificed for economy. One of the features of the sacrificed for economy One of the features of the e, which results in a considerable saving in weight and cost, with no apparent reduction in strength or ability The increasing tendency to adopt the gravity system of water circulation is another economical move, for it permits the suppression of the pump. The mechanical lubricators that were formerly in general use have been abandoned in favor of a single pump located in the crank case which is not only less ex pensive to build and assemble, but makes lubrication as positive and unfailing as it well can be. The mag neto is now the standard equipment even for cars of neto is now the standard equipment even for care of very low price, and quite frequently it is the sole means of ignition. An advantage that may be gained through its use is that the spark may be maintained at a fixed point, and therefore the spark control lever and its connections may be done away with. The locating of the clutch and brake pedals on the gear car duces the cost of assembling, for when they are hung on a rod passing across the frame as was the practice in former years, accurate fitting is an absolute and costly necessity When the engine, thange speed gear and rear axle are soparate units, assembling is com-plicated by the necessity for setting them accurately in line, in a great number of 1910 cars the change speed gear is either built in with the engine or the rear axie, and the cost of assembling is reduced in conse-

In spite of the excellence of the 1910 cars, it must not be assumed that the limit of perfection has been not be assumed that the limit of perfection has been reached Some of the work turned out by the de-signers shows that they have followed a common path, but in many cases there are differences that are not easy to reconcile. The perfected car cannot come until the sflectory of one definite construction has been recognized, and its proper proportions domo-strated. The great versions in the designs of belay is evidence in itself that there is still much to bears, is evidence in itself that there is still nuch to learn, for otherwise, as an example, there would be less difference in the dimensions of engine bearings than in now noticeable in different makes of engines of the same power. The relation of bore to stroke is the subject of a vast difference of spints on it the present time, and even the relative length of the connecting roll by no mean fixed

rod so by no means nixed.

Having produced cars that will run, and that can
be depended on for steady service, the problems now
before the designer have to do with the increase of ef-

before the designer have to do with the increase of efficiency and cromony of operation. At the present time it is doubtful if any manufacturer knews what proportion of the power of his engine is abserbed in operating the valves, or is driving the magnate and pump. But there and other him more complicated dispution, but there and other him more complicated dispution, the context of the present engine are adhered in the context of the present engine are adhered in the context of the context of the context of the features and relative dimensions that survive the ordered or usage. For the car center this will make a reason of the features and relative dimensions that survive the ordered or usage. For the car center this will make a reason of the features of the feature of the fe

The Wright suit and Aviation in America.
The granting last week by Judge Hasel of a prelimi-nary injunction restraining Glenn Curties and the Her-ring-Gututes Company from making, selling, or flying their well-known type of biplane has quite taken by surprise almost everyone versed in patent law, as such an injunction has been granted very rarely, if ever before upon an unadjudicated patent. Even in the case of the Selden patent covering the use of a clutch between the motor and the road wheels of an autobetween the motor and the road wheels of an auto-motition— one in which an infringement was much more apparent—such an injunction was not granular. The granting of the higuerion at this time has had two results in the first place it has intimidated a good many inventors who were hard at work upon the per-fecting of the aeroplane, and secondly it has ercour-aged the Wrights to attempt the creation of a monopoly in flying machines. With a million-dollar company back of them, and with orders already booked aggregating more than this figure, the granting of the p ent injunction gives them practical control of aviation in America. A second step in this direction occurred on January ith, when aviator Paulhan was served with a notice to appear in the New York District Court ten days later to show cause why he should not be enjoined from flying his Farman biple the United States. As ne is booked to make flights at the Los Angeles aviation meeting from the 10th to the 20th, this action may be a serious blow to the first actation meet held in this country The death of Leon Delagrange from a fall sustained

The death of Leon Designange from a rail sustained as a result of the breaking of a wing of his Bleriot monoplane while flying in a 20-mile wind at Pau, France, on the 4th inst, has given aviation another setback that it will take a long time and many excellent demonstrations to overcome Four lives lost with in the last four months is a record by no means encouraging to sportsmen, and unless overything possi-ble is done to encourage flight in this country, none of the aeroplane factories soon to be started will do much business for some time to come

Hydrogen for Infining Pneumatic Tires. The inflation of an automobile tire with a hand The inflation of an automoone thre with a minus pump is so laborious an operation that some sufficient mobilists carry cylinders of compressed sir, with which a tire can be inflated easily and rapidly. The which a tire can be inflated easily and rapidly. The cylinders, however, may be found empty when they are most needed. Drouctly a French manufacturer of aluminium paper, has conceived the idea of replacing the air by hydrogen, generated by the action of water on specially prepared aluminium waste. In presence of alkalies, aluminium decomposes water into oxygen or ankalies, aluminium decomposes water into oxygen and hydrogen. The oxygen combines with the alum inium and the hydrogen is set free. The method of operation is very simple. About 10 ounces of granu lated aluminium and 10 ounces of water are introduced. lated aluminium and 10 ounces of water are introduced into an air tube of the expactly, 15% plats which is the air tube of the cyactly, 15% plats when the bronse plug is quickly screwed down in a wessecond the space not otherwise occupied, about 5½ pluts, is illude with hydrogen at a pressure pluts, is made and the pluts of the pluts, is made and the pluts of the pluts, is considered to more than 100 other product of the reaction is alumina, which can easily be washed out. The special preparation classified with the adultious consists in the addition of a small per-cutant of mercury behindred which starts the reactions. centage of mercury bichloride which starts the reaction in the absence of sikelies so that pure water can be

employed.
This method possesses two advantages. It allows
overy automobilist to recharge his air tubes without
returning them to the factory. There is also a real
advantage in infasting tires with hydrogen instead of
air. The diffusion of gases through colloidst substances like India rubber follows a very different kee
from that which governs the diffusion of gases through from that which governs the diffusion of gases through prorous walls. In the latter case the rate of diffusion is inversely proportional to the square root of the deastly of the gas, but the rate of diffusion that had been successful to the section of the deastly of the gas, but the rate of diffusion to the section with which the gas can be luquided Bytpogen generated by the action of aluminism upon water was used for filling balloons in the Rosso-Japanese war, but this imperious and simple method of obtaining orginators of compressed hydrogen appears to be as new as it is interesting.

To Americans who are accessfound to Breezel car folog, it will be surprising to learn, on the accharge of The Euglanger, of London, that lear topich there will ignaturated an electric-car service from size at the London subway (table surface so the selectric of North Thoubley, on which a fare of held a cept will be chieged.

### OVERHAULA CAR.

BY HERBERT L TOWLE

In order of importance, the Relilities needed for everhaling are a warm, light place to work, an exten-sions electric light, a bench, several boxes for use promptings and supports for the dismantled parts, and is there! an assortment of tools as the owner's means will permit. An iron vise, a bench drill, a foot or win pecent. An ion vase, a clean urin; a not or power liftle for metal work, and an emery wheel are almost necessary. Falling these, certain parts can be sent to the about refitting A complete kit of bench tools is simumed—hammers, siles, hack saw, chiesia, wreachs, serswdrivers, cotter pin extractor, etc.; also

oncing according to the state of the state o the souther and sixts and greasy drop them into a pan of Brosens Have & Brige box handy for small parts, and three or four shall box es in M: for the purpose of group-ing religible small parts together It is very easy to get a car apart and shuffe the various belts, wash-ers, said other small things so thoroughly that it is impossible to tail where they er on reas embitng Apportain by

looking under neath whether the gasoline tank in attached to the body or to the chassis. If the

former, disconnect the gasoline pipe at ooth ends, plug the ends with bits of rag, disconnect the horn tube and any electric wiring that may run from the body to the chamis, take out the bolts hold-ing the body to the side and rear frame mem bers, and lift the body straight up The dash is a part of the chassis, not of the body, and does not need to be disturbed as this stage Have a couple of wood horses ready to receive the body Do not set it on the floor, as there may be parts projecting beneath it such as the ath the tank.

no amateur is advised to begin overhauling in the order of ease rather than of magnitude. For this reason the brakes are suggested as a start. Ingested as a start. In-sed rear brakes on a with side chains are rally exposed by taking of the rear wheels. Pirst see if the brake Remove the radiator, wash it out under a strong stream of water, and if it is suspected of being encrusted with scale fill it up with kerosene and let it until spring time will do no harm When reassembling it is important to give the radiator an even bearing around all four stude, supposing it to be held down by that number If possible, have it rest on 44-inch sheets of rubber, and do not draw the hold ing-down boits entirely tight. The radiator although frail, is much more rigid than the frame, and any apringing of the latter will surely start leaks in the radiator if it has to follow it. The two sketches Fire

1 and 2, show how a frame may be racked in going order a rough road. If the radiator leaks it is best to let an expert tinamith repair it (not all insmittles are expert). The secret of success is to use a good grade of solder and sweat it thoroughly into the seams taking plenty of time. If the top is not steaded it will be worth while to run a brace or stay rod to it from the top of the engine or the dashboard. This rod need be only heavy enough to check the vibration If there is much lost motion in the worm or o

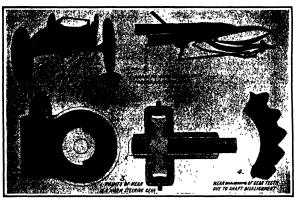
reducing gear of the steering mechanism disconnect the steering links also the throttle and spark con

nections and take the steering col reducing gear at fts base Open the casing and see where the lost motion is It may be in the threads of the worm A Fig 3, and the teeth of the segment B ever, is likely to be in the thrust be in the thrust washers C C of the steering col umn and D o' the segment shaft Frequently ball bearings are used at C C In time either these or plain washers need replacement ings EE If the stoering gear case is not provided with a grease cup, this is an excel-lent time to put one in Wear on the worm and

segment A B is
not easy to take up, an
approximate cure is to
make the bushings E
ccentric so that by turn ing them the centers of the worm and segment are brought closer together Since, however, most of the wear is in the mid die teeth the gear may be loose in the middle position and tight when the wheels are cramped over There is no rem this, save renewal edy for

The steering knuckle pivots and the pins in the ends of the cross link wear loose in time, and usually it is a shop job to ream the holes and fit new case-hardened pins See that the front wheels are par-allel or 'toe in' very allel or 'toe in' very slightly when pointing aboad It is usual to shape the steering knuckles so the steering knuckies so that the wheels incline toward each other at the ground. They are rarely vertical, and never incline the other way If the front axic is sprung have a blacksmith straighten it

Clean out gear case and test all the bushings in cluding the pilot bushing at the front end of the squared shaft, by shaking them If ball or roller them if loose, if plain bushings they must be re-fitted or replaced New hushings bought from stock generally need con-siderable fitting. The rea-(Continued on page 68.)



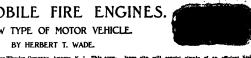
SOME PARTS OF A CAR WHICH MUST BE CARRFULLY CONSIDERED IN OVERHAULING



BOW PARTS WHAR IN AN AUTOMOBILS.

### AUTOMOBILE FIRE ENGINES.

### A NEW TYPE OF MOTOR VEHICLE.



The great success of automobile fire apparatus in Europe and in many of the smaller cities of the United States frequently gives rise to the inquiry, why are such machines not used more extensively in the larger fire departments where the highest efficiency of apparatus and personnel is demanded and main-tained. The acknowledged utility of automobiles for pleasure and business even under extraordinary con pleasure and minimess even duter cartanguary code
ditions emphasizes this tardiness the more forcibly,
particularly as the modern motor vehicle is now capable not only of attaining high speed but of carrying heavy loads Promptness in reaching a fire with suitable apparatus is of prime importance, and the auto-mobile in this respect and in endurance is easily superior to a horse To-day with high speeds pumping capacity can be secured in a motor vehicle sufficient for most conditions of service, and this, with economy nce after the initial cost, has led to the adoption of automobile fire apparatus by many of the progressive smaller cities. This economy is obviously due to the fact that only when in operation are gaseline and oil required. A horse even when idle entails expense for shoeing and feeding

Even the most conservative of metropoli tan fire officials realize that the rapid transportation by horses and the subsequent op-cration at high pressure of a heavy steam pumping engine on wheels is more or less a central power stations have largely taken of the small isolated plan when small internal combustion motors using gasoline have been found economical convenient, and efficient. The pumping power of a fire engine depends upon the weight that can be transported. As an internal-combustion motor connected with a pump would weigh much less than a steam engine and boiler and going to a fire would use the same engine for propulsion, it would follow that greater efficiency could be se-

cured Even superior from the mechanical standpoint, but not as yet practically applied, would be the mount ing of an electric pump on a gasoline-driven motor car. using current derived from supply mains near ns of operation Chief Binns of the New York Fire partment has developed such an idea which pos-ses many obvious merits. He proposes to use eleccene of operation seases many covious merits it proposes to use ere-trically-driven centrifugal pumps on motor vehicles capable of high speed and to obtain power from elec-tric light standards or other outlets which are at al most every street corner and quite as well distributed as hydrants. The same condition also prevails in many rural districts, where electric light and trolley lines are to be found on every main street. Suitable liugs and conductors could be used for connections and with the power derived from a central station the and with the power derived from a central station the portable machinery would be reduced to a minimum weight A similar idea, though not so elaborately de-viloped, was put into operation more than twenty years ago by Dr S S Wheeler, now president of the Crocker-Wheeler Company, Ampers, N. J. This apparatus consisted of a bipolar motor directly coupled to a pump, and was mounted on a light carriage. The gasoline motor car was not so highly developed at this time, for which reason the carriage was drawn by es. A fire engine built on this plan was trie on the Eric Canal at Schenectady It was finally brought to Ampere, and was destroyed in a fire which occurred there in 1895 Strange to say, this achems, which would involve comparatively little outlay for a large city, has never been thoroughly and practically

At p nt motor apparatus is most widely used in suburbs and small cities with wooden dwellings, in other words, in communities where its high sperenders it possible to cover a much greater territory by a single company, and where infrequent alarms reduce the expense of maintenance far below that en-tailed for feeding and shoeing horses. For example, a St Louis motor company recently made a run of nine miles to a country villa outside the city limits and ar-

MOTOR-DRIVEN CHEMICAL ENGINE.

rived in time to save the house. This san in a period of eighteen months respond fires without a single failure, and in so doing traveled 2,250 miles in all conditions of weather, including mud, sliest and snow The economy of this company is apparent from the fact that its maintenance account for twelve months was \$48131, including two actions, which resulted in an expense of \$250, as compared with an annual cost of \$516, for feeding and shoeing two horses Even in a district where there are no water supply hydrants, such a machine can make a speedy run, and draw water from a well canal,

In a large city the question of territory is not as important as that of speed in getting the firemen to the fire in a district with high pressure fire protec ccur which taken in time may not require the powerful streams from the fire hydrants and could be put out with a minimum of water damage. Indeed it seems likely that the future fire protection of a large city will consist simply of an efficient high-pressure water system and automobile engines and one wagons.
In a description of modern automobile fire appar

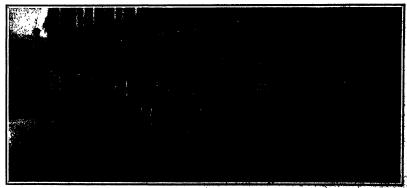
JANDANA IN 1916.

In a description or moners automouse are agreement see may mention, first, the high-speed touring ear or runabout, for the use of chiefs and supervising offi-cials, capable of rapid traval and of covering wide spe-tions of territory. This was the first automobile used by fire departments. Such a car does not usually, easy extinguishers or any fire apparatus, one or extinguishers or any are apparatus, extinguishers and axes or ether tools bendered only in rare instances. All that is demanded a machine is a high quality and reliable model of the control of the cont only in rice machines, and that is tensioned a machine is a thin quality and reliable more is de milleriest speed and early control. In hard, we have the sa thirty man and the Conser are from the same and the Conser are from the control of the Conser are from the control of the Conser are from the control of the Conser are from the conservation of the conservation of the significant to river of this conservation of the con

city Extingulahers and tools are dismossible of the most sidered essential. The chief carries with him not only a chauseur but one or two first ment from the permanent headquarties force. If rapid travel is desirable for the chief, it is of course equally advantageous for the firemen responding to an alarm. In small nremer responsing to an atorin. In small blasse such as those caused by a certain blowing against an open gas light of by a short-circuit of a lighting system, one of two men with axes and hooks promptly on the scene can prevent what might be a "gettions ingly it was early realized that auxilfary or emergency squads could be equipped with motor cars and could be dispatched at high speed to the scene of the fire. These men deal with an incipient fire or prepare for the

steam engines which follow and if necessary send is additional alarms or communicate by telephone with dquarters. This type of equipment is exte used throughout the United State

But it must be realized that this means simply the prompt bringing to the scone of action the trained men who can take care of the smallest kind of a fire ne where the blaze is at all serious. It was with this end in view that automobile fire-fighting facilities were increased by adding a chemical tank and a few hundred feet of small hose. The chemical tank and equipment has now become an indispensable feature of many fire departments. Carried on horse-drawn hose wagon, a small fire can be quenched in its incipiency by its means with a minimum use of water and consequent damage. The chemical tank consists of a copper cistern of from 40 to 70 gallous capacity containing bicarbonate of soda and other chemicals with which sulphuric acid and water may come in



### JANUARY 15, 1910.

Scientific American

continued to generate carbonic-said gas at such pressure of to be invited with the water through a small hose cost is some first departments, but it is fair to say has been improved or found unavailable in others. Espe-cially is this true of New York city, where the pro-tice has always been to concentrate at a fire adequate and to say harmy continued to the same of the continued of the same of the continued of the continued of the true of the continued of the

take no unances must even at the risk of water damage to err on the side of safety in the korse-drawn combination wagon the chemical task and the small high usually carried upon the driver's gast is but an incidental feature, the body of

the wagon being reserved for larger fire-negice hoss. Int in a property designed automobile such appearation can be sped to the some of a fire with four to sight one at from 60 to 50 miles an hour. Thus for a fire control of the co

that such chemical engines be supplied in the ma-jority of fire departments to answer at once on the first alarm

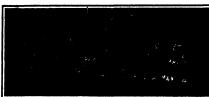
first starm. The next step in the progress of the small motor chemical engine was to make it larger and to add to the supposed. Accordingly combination engines were designed which not only carried the chemical enginement but also does for the following stems engine, scaling ladders, tools and other apparatus, thus enabling the men to prepare the way for more serious operations and saving valuable time. In this field a number of vary efficient types have been evolved Next in mechanical day-logment course the motor Continued on page 40.



\* the state of the s

A NEW YORK AUTOMOBILE HIGH-PRESSURE SERVICE WAGON.

AN AUTOMOBILE HOSE CART



FIRE CRIEF'S AUTOMOBILE



A COMBINATION TRUCK FOR SMALL COMMUNITIES.

MOTOR-FIRE PUMP AT WORK



A CONFESSOR APPROXICE FIRE DEPARTMENT.

### AUTOMOBILE NOVELTIES.

SOME INTERESTING DEVICES FOR THE SEASON OF 1910.

A HEAVY TRUCK WITH FOUR WHEEL DRIVE

The adoption of trucks in rural districts is a dim-tult though very important problem of the automobile industry. Bad roads and sandy soil create a number

With a single trailer gradients of 7 to 8 per cent can be appointed at a speed of 5% miles so that the can be appointed at a speed of 5% miles so that the creaters also through deep and The weight of the car inclusive of its equipment



TRACTOR TRUCK (60-HORSE POWER 6-CYLINDER) HAULING A TRAILER

THE CO-HORSE-POWER MOTOR OF THE FOUR-WEEKL DRIVE SERVE

of difficulties which can be overcome only by special construction

One of the most important points se utilization of all four wheels for driving thus increasing the adhesion This is especially imperative ing the adhesion This is especially imperative in the case of heavy motor cars employed as tractors for load trains consisting of two or three vehicles where a weight of several tons acting on the fore axie can be utilized for adhesion

simler Motor Works of Germany have con structed for a well known Berlin export firm a beave truck with four wheel drive which is being shipped to South Africa in order there to take up its heavy duties in propelling as tractor a train of 10 to 15 tons. This car shows a number of technical features

ders with compressed transverse beams and lateral shields. The six (ylinder explosion motor located in a three point suspension yields 60 horse power at the brake with 9:0 R P M This motor is of the familiar

Daimler type with magneto-electric ignition

The maximum speed of the car is 10 miles per hour The low minimum speed 14 mile an hour is remark able thus fully utilizing the advantage of four wheel drive for the overcoming of gradients and traveling over sandy soil without increasing the dimensions of the gear case. As only the for, wheels are sterable the rear wheels are driven through a toothid wheel

The cast steel wheels have broad rim flanges which are intended to prevent the vehicle from penetrating too deeply into the sand. The solid rubber tires are pressed immediately on the wheels. The fore wheels are steered (seentially in the same man cars through worm gearing. The vehicle is equipped with four brakes operated independently of one an other vir a gearing brake two differential brakes and one rear wheel trake The motor car which is design ed for a useful load of fone is able to haul tw trailers of the same capacity while negotiating gradients of about if per cent with this total load of 130 hundredweight at a speed of 1½ miles an hour is about 12 540 pounds of which abo on the fore axie so that about 6270 pounds on the fore axie is utilised for adhesion

#### THE PARSONS SPRING MOTOR WHEEL

The many well known defects of the pneumatic auto mobile tire have prompted many inventors to att to evolve an efficient and reliable substitute the without any sarrifice of resiliency. The general trend of inventive effort has been to secure this quality by some elaborate arrangement of springs without how ever completely solving the pro

Early in 1900 however the Hon R Ciere Parsons MA M Inst (F directed his attention to this sub-ject The object of his quest was to devise a wheel which should be as resilient as the pneumatic Al though the first cost of such a wheel might be some what higher than the pneumatic such a difference would be more than compensated for by

the lower mainte-the longer life of evolved the spring

the accompan mpanying Panflex prises two essential parts—a double sisting of (1) an os into which a pressed and an in formed by riveting oxidisable metal on outer channel and disposed coll ing wheel the chan nished with corre having polished around the internal channel for the transmitting the engine and the re the brake from the

outer rim In a

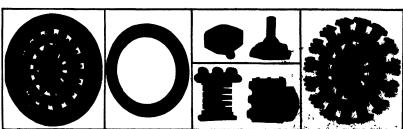


lustration showing the wheel center co comprises an ordinary wooden-spoked wheel of small diameter having a groove around its circumference on each side of which is shrunk a steel band or tire on each side of which is shrunk a steel band or tire in such a manner that a groomed space is left preceive the heads of the Thoits by which the agiral springs are secured to the rim of the wheel suprings are secured to the rim of the wheel suprings are secured to the rim of the wheel suprings are of the ordinary optimistical types so colled as to fit into aluminum castelline for all the suprings are shown that when compressed the state is not overspubsid. For protection against runt the aprings are shown that the compressed control in the throughly these did not all suprings are shown that the suprings are shown to the supring are show

for a length of about haif a coll.

The aluminum castings by which the sortings are attached to the wheel center are of special denies on one face they have a spiral tunnel or thread, so that the spring may easily server into them, and are also provided with suitable lugs in order that they may be gripped by the Thoits A steal take have been been as the creat pictor as also creat picto the atuminum hase which projects up the sais of the springs as shown in the illustration. The aluminum castings forming the caps red takinest to the outer ends of the springs are also provided with spiral tunnels on one face into which provided with spiral tunnels on one face into which provided with spiral tunnels one can feel that which the contract of the spring are also milks in the contract of a section similar to those used for carriage time are specified. A hole is drilled into the center of these cape harding at diameter condensately greater than that of the specified attantive condensately greater than that of the specified attantive condensate properties of the specified attantive condensate properties. A hole is drilled into the center of these cape haring a diameter considerably greater than that of the sized tabe attached to the base so that a space is left between the tube and the centry of the interest that the contract of this arrangement is that in the event of the against culton of an accessive sized force such as sudden and violent throwing in of the ciutho or braking or the wheels being count in a rut the tube comes into contact with the side of the hole thereby preventing the agring from being overstrained in any direction at right states to its sain. In the case of this powered complete the contract of the contract of the proper of the contract of t rubber pad vulcanised to a steel plate which is at-

The springs are inserted into the spiral tunnels at



THE COMPLETE WHEEL ASSESSED WITH ALL ITS SPRINGS.

THE SUTTER RISE AND TREAD

THE SUTTER RISE AND TREAD

TABLE RESERVES TO WEIGH OPENING ADD

ATTRACEGE, SPRING RASE AND CAP ADDRESS.

THE PRINC V. e alle gales ette

sir respective ends, and after correct adjustment are saided to a certain temperature, insufficient to in rer their temper, and melted solder is then run in high unites with the timing on the spring and sese and spring togeth e as to preclude any possibility of their be-

coming loosesed
The lower springs, i. e, those just above the point
of the wheely tread, are compressed under the weight
of the while while those at the top do not the
the dreumference. The spring pertion is therefore
presciously fonding, for at no part is there any rigid
connection between the inner and outer parts of the
terms whether the regime and outer parts of the
terms whether the rigid and preciously facatine, for at no part is there may right connection between the since and outer parts of the wheel When the whell is in motion the spring and cape in its lower pecton take the whole of the weight of the which and not be not shirt that position relatively with her rim bot do not shirt that position relatively with the rim bot do not shirt that position relatively that the state of the second ship of the second become diseasgaged and move round like the scokes of a rigid wheel their places (unmediately being taken by others: The diseasgand aprings travel forward relatively to the rim in the direction is which the validie is moving. The result is that the central period of the wheel makes a slightly greater man period of the wheel makes a slightly greater man period of the wheel makes a slightly greater man above. At the same time however it is impossible for the laner part to travel round independently or part to travel round independently of the outer rim or tread of the wheel since it is al the owner rim or tread or the wheel since it is all ways tightly in contact therewith at the point of the wheel's contact with the ground which is the point of application of the vehicles weight the rubber strips or approximate or the ventors a weight the rubber strips of the outer extremittee of the springs establishing such adhesion upon the surface of the interior of the run as to prevent any possibility of alipping. Yet there is no perceptible wear and tear upon the two counted surfaces In the case of the driving wheel the gripping power of the spring members is very considerably augmented by having the corrugated sur-face as already described

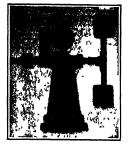
compression of the springs as the wheel revolves is quite continuous and is effected with the utmost smoothness as the spiral springs with their caps can be defected in every direction Sudden jerks or concussions cannot occur which even with pheumatic tires are unpleasant features when traveling

at high speed over a bad road surface.
It may be thought that the absence of rigid con nection between the inner and outer parts of the wheel may be disadvantageous but experience has quite conclusively demonstrated that no such draw back exists It is practically impossible for any alipping between the two parts to occur even when the vehicle is badly driven. There is no friction be-tween the rubbers in the free ends of the springs and the internal surface of the channel rim. The springs as it were walk round the inner circumference of the outer rim on a polished metallic surface and are ely loaded with their due proportion of the car weight during each revolution. The moment the weight is applied to any spring the latter cannot possibly move relatively to the rim until the weight released Consequently there is an entire ab caps will last as long as the wheel tire Even in the rare event of the rubbers of the spring end become damaged it is an insignificant item in renewal

ing damaged it is an insignificant from 'n renoval but no such occurrance has yet been experienced though wheels have been driven for thousands of miles Even the entrance of dost or mid has no detailorating effect upon the two surfaces of the contract of Trials have shown that the average life of the outer solid rubber tire is from 1000 to 1300 miles which is about two and a half times that of the ordinary pneumatic type Though in first cost the Panifer," wheel is more expensive than the pneumatic this dif-ference in initial outlay is soon recouped from the



#### Scientific American



A PAR DYNAMOUSTER FOR TESTING MOTORS

reduced running expenses. It has been found that the cost per mile with the pneumatic averages about 198 cents as compared with 048 cent for the spring wheel—a difference in the latters favor of 150 cents Moreover as the wheel itself is practically everlast ing the renewal charges are limited to the solid rub which costs much less than a pneumatic of nor the water cost much less than a preumatic of the same dimensions and the rubber caps of the spring members. Occasionally as the result of a very severe concussion or joit a spring might break. This can be easily and quickly replaced on the road but as the defaction of the spring is limited in every direction. by the central tube the stress to which the steel is subjected need be no greater than that in the side springs supporting the automobile Such an eventu ality is therefore remote Age in with this wheel in



LANGERT AUTOMOBILE BAILWAY OAR BUILT FOR MARRIMAN BRANCH ROADS

view of the ingenuity of its construction the ever existing danger of side slipping is reduced to a neg ligible quantity owing to the flexibility of the wheel

### AF AUTOMOBILE CAR FOR RAILWAYS

The accompanying illustration shows a sp lered by E II Harriman before his death which is to be used on a private road running from a point on rie Railroad to the Harriman private residence

The car is a Lambert friction drive and was ordered e of ascertaining whether for from 12 to 15 passengers could be utilised more economically than steam cars on branch roads on the Harriman lines Whether a car of this character will come into general use will depend upon the result of experiments to be made

AN AUTOMOBILE SUFFET TREDER
A novel automobile tender has been devised b
G L Reeves Mounted in the body across the end is a three-burner gasoline stove or one gallon gasoline tank Next forward is a receptaciin which is fitted a complete cooking outfit each arti-cle nesting and telescoping into the other The outfit cee nesting and to telescoping into the other. The outline consists of two frying pans four boiling vessels of fee pot twenty serving plates three sauce pans and eight soup tins. To the left of the cooking outfit is a three-bin vegetable cellar with tray lid for large cook ing spoons cake turners carving forks etc. To the right is a gaivanised iron lined refrigerator centaining six one-pint glass sealers ice receptacle and large me

tray
Immediately forward of the refrigarator and extending to the end of the bed is a seven gation water
coder. To the first of the water condex as theircest
for the seven coder as the seven gation water
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cred on the inside with padded olicioth, and on the outside with rainproof ducking. The meeting edge of one cover is provided with a patent leather flap and case over is province with a parent leather hap and is held in place in trainit by two large straps which buckle securely and make the tinder rain and dust proof. A small brass hasp and lock is also furnished. A neat little folding dining table is strapped to the in side of one of these lids.

An extra broiler a cooker for emergency a pocket ax and a camp lantern strapped to an outside bracket complete the outfit

The refrigerator and water cooler are fitted with drain cocks. A rigid pair of folding legs is provided to support the end of the body when disconnected from

The wheels have rubber tires and the several parts are so accurately nested that the tender moves even at twenty to twenty five miles speed without noise and takes corners perfectly

takes corners perfectly.

The tender weight 475 pounds and the extra draft on the automobile is scarcely perceptible. It has been used in serving a great many roadsid, dinners and its entire practicability for such service established be-

#### A VAN DYNAMOMETER

The standard type of fan dynamometer shown in the accompanying photograph has been devised by Joseph Tracy it consists essentially of a metal standard carrying a horizontal steel shaft in large ball bear "arrying a horizontal steel shaft in large ball bear ings One end of this shaft is connected with the motor under test by a universally jointed extension shaft the other end (arries an overhung two bladed fan as shown On the dynamometer shaft a small pulley fitted to a bose on the rear of the universal joint is belied to a larger pulley on the special tacho meter which is mounted on top of the housing that carries the dynamometer shaft

The tachometer of the standard fan dyna provided with a double scale and single pointer the wing the revolutions per minute the outer scale the horse power developed. The never lutions per minute scale is argument progressively by divisions of 20 revolutions from 200 to 2000 r volu tions The horse power scale gives a minimum reading of I horse power at 480 revolutions and a maximum reading of 70 horse power at 1980 revolutions Consequently at all ordinary rates of motor speed a simultaneous reading of revolutions per minute can o obtained without any computation The standard fan dynamom ter can be employed in

The standard fan dynamion ter can be employed in testing motors on the block by making suitable con noction between the jointed dynamiomiter shaft and the motor shaft clutch or flywhici it can also be used to test an automobile motor in position on the chassis by disconnecting the propeller shaft and sub-stituting for it the jointed shaft of the dynamometer. The standard dynamometer is designed to test mo

The standard dynamometer is designed to test mo torns of natium sized care. However by the use of fan blades of greater or icas area and suitable tacko-meter scales the range of absorption and measure-ment of power can be varied between wide limits

The Tenth National Automobils Show in Madison The Tenth National Automobile Show in Madisot Square Gardon afforded a good opportunity of inspect-ing the product of representative American makers I he exhibition brought out some novelities in con-struction and design which showed a gratifying lead incy toward standardization. That the modern overy day motor car generally known as a stock (ar has left the misty rone of experiment and is now a practi d useful machine was strongly emphasized by the many performances in hill climbing touring and racing contests of 190). There is a comprehensive display at the Garden of duplicate models of the stock display at the Garden of duplicale months of the stock cars that competed successfully in the various aport-ing events of the year. Some of the original cars are shown. Thanks to the adoption of certain standards a new model need no longer be put this only years of testing before it is entered in competition with other cars Recently victories have been won by certain makes of cars that had scarcely competed in previous



THE BUTTET TREBURE IN USE

#### ARTI JOY BIDE DEVIOUS

(Continued from page 49)
ade by fiexible shaft connection with one of the vehicle wheels.

5. Combination mechanisms, embracing switch and engine hood lock and vibration recorder

Some of these devices are now to all intents practi-ally obsolete and out of the market, and there never cally abo been any general demand for any of them except se intended merely to prevent meddlesome persons and mischlevous children from tampering with ma-chines left standing at the curb The one class of device that is in almost universal use is the lock switch Almost every large manufacturer of ignition spark coils and switches offers a current switch with a reor lever or fitted with a lock and key by which the connection between the battery or mag-

by which the connection between the battery or mag-net and the engine spark plugs can be broken and prevented from being re-established readily. The type of switches with removable plug is illus-trated in Fig. 1. Switches of this type are known as plug cut-out switches and are now designed to be used with a dual system of ignition, so that either the six-tery or magnets can be switched him use or the cur-rent from either of two batteries turned on. When the circle is a second of the cut-ofthe car is stopped, the metal plug, with insulated han die, which makes connection between the two termi-nals within the switch, as shown in the underside view, 1, is withdrawn and the circuit is broken. The Fig. 1, is withdrawn and the circuit is broken. The engine cannot then be restarted until the plug has been replaced or electrical connection has been re-celabilished in some other way. The plug is small and cap be carried conveniently in the pocket. A modification of this type which precindes the po-

A monincation of this type which previous the pos-sibility of inserting a nail or piece of wire as a sub-stitute for the plug is shown in Fig 2, in which the switch lever is removable. There are numerous makes of such switches. The ond of the lever engages by a switch lever is removable. There are numerous makes of such switches. The end of the lever engages by a sist or keyway with a post that prevents it from dropping off and at the same time sensits in forming an electrical connection. The other end of the lever, the with a non-conducting composition handle, can be swang in an are or complete circle to make centure with any desired contact button for use of batteries or magneto or to neutral "off position seems to the second position of the po

sock is applied to a plug cutout switch in such a way as positively to prevent the closing of the circuit through the switch without the proper key or its dupli-cate. The lock is placed directly above the plug socket, thus preventing the insertion of a nail or wire socrac, mus preventure the insertion or a hall or wire The cutout plug is connected with the mechanism of the lock so that it is thrust in or out by the turning of the key The key cannot be removed from the lock until the circuit is broken Each lock requires a dif-ferent key, of which two duplicates are furnished to

The Yale lock, with sliding plus cor The Yate lock, with shiring ping confidence to take the place of the regular cut-out plug, can be fitted to various styles and makes of switches, being beld on by screws of a special kind that cannot be removed to the control of th except with a double-pointed wrench made just to fit m in the screw heads.

the recess in the serve heads. A device of somewhat similar characteristics to the foregoing is the break-circuit autolock (Fig 4), which is manufactured in different forms for use on electric and gasoline vehicles. The type illustrated is for electric machines, but the operation of the two styles is similar. When the switch bar, just above the barrel of the Yale lock, is pulled forward it breaks the circuit and remains locked in this position until one of the and remains occased in this position until one of the two keys furnished with the device is inserted and given a balf turn, when the connection is re-estab-lished automatically by the switch her springing back into place. The electric vehicle lock is installed beneath the upholstering on the arm of the seat, when only the face of the lock is exposed. It takes the place of the ordinary cut-out plug, so that the operation of the lock is no additional bother

The break-circuit lock for gasoline vehicles (Fig 5) is made in different styles to apply to various systems of ignition. It is placed on the face of the coll box, taking the place of the usual switch. The switch-bar is round and provided with a winged head, so that it is round and provided with a winged been, so that it can be rotated to make connection with battery or magneto or to "off" position at will. When it is pulled forward it breaks the circuit completely it is not necessary, however, to turn the bar or plug to neutral

necessary, however, to turn the har or plug to neutral before locking or unlocking the switch. Another means of accomplishing the purpose of pro-buting modifications persons from using a car left standing in the street or garage is the Rochester steering wheel lock (Fig 6) This is hinged so that the hamp can be placed around the steering column. A steel pin at the back of the hasp nature a quarter-inch hole drilled through the outer and inner steering culumns. When the hole in the inner column, to the top of which is larged the steering hand wheel, has the column to the column to the column to the top of which is larged the steering hand wheel, has the column to the lock has been innered through lock. prin of the lock has been inserted through both, the front wheels cannot be turned.

The special feature of this device is the combination ock that renders unnecessary the use of a key, which may be related foresten or lost. The barrel of the contains three tumblers each provided with a lock contains three tumblers each provided, with a small lag on either side which engages with the cor-responding lag on the next tumbler. Two tumblers are restanded to an internal tap cap but are free to retate on its center pin, while the third tumbler is re-movable and lies in the body or casing of the lock over a solid post that passes through its center. All the tumblers have a large notch is the periphery To open the lock it is necessary to turn the external dist hand into line, allowing the each of the hase to pass. This can be done only by working the lock combination. The lock can be oversited in the days in the dail is

The lock can be operated in the dark, as the dial is otched so that by starting at 0—which is distinguished by a large or open notch—the movement of the hand over the dial can be counted as the spring points drop over the dial can be counted as the spring points drop successively into the serrations. When the lock is open, the combination can be changed in two mileutes if desired Except for the stead plan, this lock is made entirely of brones and is made in different sizes to fit sterring columns of different disensets. The nanuta-turers have also produced an adjustable hasp steering column lock made with four-tumbler combination and operated by a key

In division B of group 2 is a new invention brought out this season under the name Bongartz autoloch (Fig 8) The device is designed as a lock to prevent use of the gear shift lever and, if desired, also brake lever It consists of a simple lock incas pollshed heavy brans case to be attached to the side of the car or the footboard directly behind the lever of the car or the footboard directly behind the lover quadrant, and a rod with a bead on one end and a recess in the other end to be engaged by the plunger of the lock. With the gear-shift lever in neutral or in operative position, a hole of suitable size is drilled through the quadrant and shank of the lever to receive the rod The lock case is then secured to the body or frame in such position that the hole for the end of the rod will be in alignment with the hole drilled through the quadrant Now, when the car is stopped and the gears unmeshed, the rod can be inserted and engaged in the lock, when it will be impossible for anyone not

ascening the key to start the machine.

A notable advantage possessed by this device is that, A notanie avaniage possessed by this device is tank, while preventing the ear from being driven on the road, it does not interfere in any way with its move-ment by hand in the garage or with the adjusting and "tuning up" of the engine and its attachments by the chauffeur or workmen.

chauffeur or workmen.

Not only is it sessential that the unauthorised use of motor cars should be prevented but it is almost to under cars should be prevented but it is almost the speed esthusiasm of the hired chauffeur even when need to be over its occupying the tonema or interior of the time of the owner is occupying the tonema or interior of the time of the owner is occupying the tonema or interior that the owner meds a check in himself, as it that the owner meds a check on himself, as the exhibitation of a good road, bracking simmephers, and other than the owner and the owner of the owner owner. smoothly running car he may unwittingly let enthu smoothly ranning car he may unwritingly let children slasm overstep discretion. Numerous afforts have been made to produce something that would accomplish such results by the sounding of audible signals when the car had attained to a certain speed or by the dis-play of a prominent speed indicating device that could be read at a distance by every passerby. The objections re read at a distance by every passer-by 'I'mo opercions to these devices, however, were so obvious that they never met with favor except on the part of persons stilleted with motorphobia and lawmakers eager for popularity among their constituents.

A practical device intended to accomplish the same results in a much better and more effective way has been brought out recently for use in combination with a well known make of speedometer This is the Jones automatic speed-control governor (Fig 9) The mechautomatic speed-control governor (Fig 9) The meen-anism consists essentially of a speed indicator, an automatic circuit breaker. a controller switch, and an electrically operated air valve, not indicated. The electric switch, which has five or more points of contact representing circuits, is operated by the action of the centrifugal governor of the speed indicator. The switch is so arranged that when the indicating hand of the speedometer shows a speed of ten miles an hour the switch will close the circuit through the first conthe switch will close the circuit through the first con-lact, when the velocity of the governor is such as to indicate fifteen miles an hour on the dial, the switch closes a circuit through the second contact, and so on up to any desired number of speeds or contacts.

on up to any desired number or speeds or contacts.

By setting the pointer at any figure on the dial of
the controller switch, the circuit can be made to
close through the corresponding contact only and
at the indicated speed When this circuit is closel, at the indicated speed When this circuit is closed, it actuates the current to the primary of the inflowtion or spark coil, thereby cutting off the spark from the angite Or it may be arranged to operate the electrically controlled air valve or throttle, shutting off the supply of air or gas to the suchus and thereby prevanting the speed of the our from exceeding the instead limit. As soon as the speed is reglaced, the contact automatically cuts for and the suggipe soft is prover again. Blooml the politics of the ogertrelling switch he set at an intermediate position, as in illustration, the device will have no action whate on the speed of the one.

as the operate mixer.

As the controlling switch can be located abuset anywhere in the car, it is evident that the owner or any occupant of the rule heat can limit the speed as desired, regardless of the driver. The device operates

desired, regardies of the driver. The device operates stiently and is always on guard, giring a sense of security in passing through sections where the speed regulations are rigidly enforced. An example of the vehicle movement indexing instruments cleanized under A, group 4, is the valid-dey ribration register (Fig. 10½) This operates on the principle of the pedemeter, 4 pendium or weighted arm being held normally in a horisontal position by a light spring and caused to best by reason of the momentum of the weight following every downward and mowest movement of the instrument. Each beat and upward movement of the instrument. Each beat and upward movement of the instrument. Back robat of the pendulum releases a tooth in the train of gears which actuate the indicator hand and register figures on the dial The dial is 2½ inches in diameter and is divided into 100 degrees. These divisions do not represent either hours or miles, but serve as a measure of the vibrations. Different cars oscillate vertically in different periods, it has been found, but each machine orcillates very nearly the same number of times for successive miles irrespective of its speed. Engine vibra-tions when the car is standing still do not affect the instrument, therefore the device makes no record ex-cept when the vehicle is in motion.

The instrument is intended to be attached permi ently to the car so that it cannot be removed with needily to the car so that it cannot be removed without the owner's knowledge and is securely sealed so that no one can tamper with the register There is no shaft or wires connecting it with any working part of the automobile whose detachment or disconnection would render the recorder inoperative. The owner, having by observation determined that on his n

having by observation determined that on his machine the instrument indicates any 10 points for each how of travol, will have no difficulty in determining from the reading of the dial how many hours his machine has been driven after he leat had it out.
A different type of whelice movement indicator is represented by the Bullard recorder (Fig. 7) This provides a permanent record on paper of the hours during which the while was used, the rate at which it was run during every mile traveled and the number and duration of stops made. It operates by a combi-nation of clockwork movement and flexible shaft drive from one of the road wheels. The clock mechanism rotates a circular paper dial that makes one complete revolution every hour in the same direction as the hands of a clock. The dial is divided into sixty radial spaces representing minutes, every fifth line being spaces representing minutes, every fitti line being heavier than the intermediate lines for convenience in reading From center to circumference there are twelve circular divisions, also corresponding to the hours. Within the instrument is a stylus operated by both the clock and movement of the car, which makes a perforation in the paper dial for each quarter mile traveled, every fourth perforation being deeper than the others to indicate the completed mile. The stylus is at the extreme outside space when the instrument is r a record and moves toward the center at the rate of one space each hour, being moved by the clock and requiring twelve hours to move across the dial, where it becomes inoperative until reset.

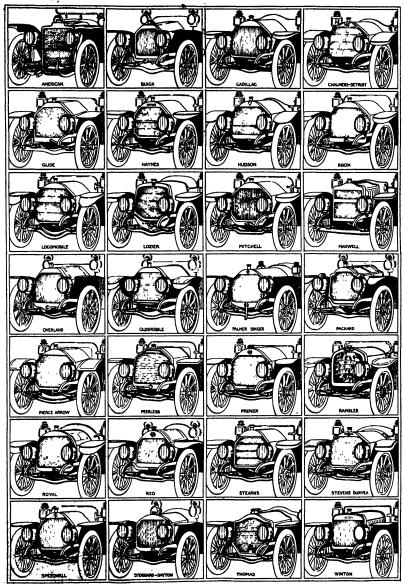
So long as the car stands idle the dial rotates with-ut being punctured by the stylus, but for every quarter mile the car travels (if a pleasure vehicle) one perforation is made. And according as the machine is driven fast or slow the holes are close together or er part. At the rate of a mile in four minu fifteen miles an hour, there will be just one hole for ach radial division, while at sixty miles an hour there would be four By examination of the dial it is non sible to determine the exact hour and minute at w sible to determine the saxet hour and minute at which the car was started and stopped. Combined with the instrument is a tiny ofcensive which registrar the total misses up to 10,000. The instrument depends for misses up to 10,000. The instrument depends for clockworf and the same connection with the readed upon the perforating system because it, cannot be tampered with without detection, no iar or joil of the car can desuage it and odd weather or dry common reader it incorrective. For use on commercial which me the car can desuage it and odd weather or dry common reader it incorrective. For use on commercial which me the car can desuage it and odd weather or dry common commercial which is the control of the car was provided in some commercial which we consider the control of the car was a supplicable to the control of the car was a supplicable to the car was a successful which is nected of every quarter.

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### MAKING YOUR OWN REPAIRS.

BY ROGER B. WHITMAN.



To one who is familiar with the methods employed in the average automobile repair shop it is not sur prising that warrs of ears complain of the size of their bills. Intering that the intering is usually for labor at so mu h an hour but there is no way in which at so mu h an hour but there is no way in wonk a the own r can assure himself that part of the time charged for was not wasted The difficulty of check log a labor charge is an inducement to a mild form of swindling and it must be admitted that there are shops in which an hours work by an untrained hop is charged for at the rate for skilled labor. The again time may be wasted unintentionally. It is not again time may be wasted unintentionally it is not unusual to find that after assembling an engine not agearsat the work must be undone in order to fit an overlooked part or to correct an adjustment that should have been attended to in the first place and in such an event the total time occupied is usually charged to the owner of the car

When the prospective purchaser of an automobile is of a properly inquiring turn of mind he will ask his friends to let him see their bills for repairs and maintenance and will probably gain the impression that automobiling is an expensive diversion—if he has any mechanical ability however he will realise that three-quarters of the work charged for could have been done with simple tools and an ordinary knowledge of

own work becomes no familiar with the mechanism that it is institutive with him to recognize the signs of coming trouble if corrects faults at their neption and by so doing be obvistes an otherwise inevitable delay and expense Aside from the economy of it the owner who does his

The following notes are offered as suggestions to the owner who desires to render himself independent

VALLE GRIEBLING

At more or less frequent intervals the valves of a gazoline engine and particularly the exhaust valves will become rougheed and pitted. When they are in this condition they cannot be expected to retain the compressed gases and in consequence the engine can not deliver its full power. It then becomes necessary to grind in the valves which is accomplished by in troducing an abrasive between the valve and its seat troducing an abrasive between the valve and its seat and rotating the valve under light pressure until the surfaces are worn smooth. This is usually considered to be a job for a repair man but as it is patiente rather than skill that is required the car owner need

not hesitate to undertake it

Before grinding can begin the valve must be re
lieved from the pressure of its spring in many en gines the valve seat and spring are contained in a cage that is easily removed and the detaching of the spring from the stem is an easy matter. When

the valve seat is integral with the cylinder the spring of a special tool or by a flat metal bar used as a lev r lo prevent the valve from mov ing a small block of wood may be placed between the valve disk and the valve cap When the spring is compressed the device through which it acts on the valve stem may be removed. He valve may then be taken out through the valve can open

When a valve is in bad condition the surfaces of the disk and seat are rough and pitted. It is not necessary to continue the grinding process until the entire width of the surfaces is smooth for a narrower ting ot belt is sufficient to retain the gaves if it is entinuous and unin

terrupted Findly powdered enery mixed with ma chine oil is a satisfactery abasine but whatever is used great care must be taken to keep it out of the cylinder and away from the bearing surfaces. The laneage between the valve pocket and cylinder should I tightly plugged with cotton pasts a string fied to it () illitating its removal when the work is completed her a hadly worn valve the first grinding is done with course emery which is later replaced by a finer

grade to give the requisite smoothness. To apply the abrasive dip the finger tip in machine oil and then it dry emery the small quantity that adheres being applied to the valve surface. The valve is then replaced on the sear and rotated by means of a screw excellent results may be obtained by means of an 8 inch or 12 inch screwdriver with a round grooved handle which is held between the extended paims A con



tinuous rotary motion in one direction will tend to tinuous rotary motion in one direction will tend to wear the valve oval and it is necessary to turn it first in one direction and then equally in the other A slight back and forth motion of the hands will give this result and as only a light pressure is neces sary it should not prove tiresome

In order to preserve the true circular form of the valve and seat the valve should be lifted after twenty or thirty turns and replaced on its seat in a new position To facilitate this a few turns of a helical spring may be placed in the valve pocket under the disk its size and strength being such that the valve will be slightly lifted from its seat when pressure is taken off the sciewdriver. The location of the spring is shown in the diagram

is shown in the diagram

When the vulve surfaces appear amouth all traces
of the emery should be washed away with gasoline
case being taken that it doos not lodge in the vituder
valve siem and push rod guides or other bearing
parts 10 test for the make peace! marks on the
valve seen and give the valve a turn or two with the acrewdriver if the fit is correct the marks will be erased

The replacing of the valve apring is greatly sim lifted if it is compressed in a vise and bound in the plified if it is compressed in a vise and bou plified if it is compressed in a vise one compressed state by light iron or copper wires principal it lengthways. The spring may the

to notice the exact posttion of a piece betwee he takes it off and in general is unobservant or the forestgift that would go her to simplify the reasonability of all time is not an object he will overtually get all the parts properly rebuilt but if he aspires to be a good man he must leave to be methodical in everything

The first step in diamounting any part of an auto-mobile is to ascertain what holds it in position what other parts may have to be displaced in order to get at it and what parts may be released by its re-moval To take off an inlet manifold for instance it may first be necessary to remove the carburster which in turn will require the disconnection of the gasoline

plps and throttle control.

The plan of action having been determined work
may begin it will greatly facilitate reassambling if
nuts boits screws and other small parts are placed in boxes the parts belonging to the inlet plps in one, inspection plate bolts in another and so on if these larts are laid indiscriminately on the engine and frame they are only too likely to fall into hand holed and other openings and aside from the difficulty of secovering them they must then be sorted

16 overing them they must then be sorted
Where several parts are alike in shape and size—
valve caps for instance—it should not be taken for
granted that they are interchangeable
Bach may
have been direct to its particular location and on the
chance of this they should be marked before being removed so that there may be no error in returning them Home manufacturers are careful to mark all parts by letter or figure or with a prick punch and when this ister or squire or with a price punch and when this is the case the marks should be followed absolutely in the case of greats it is usual to make three punch marks at the point of meshing. To reassemble them correctly it is then necessary only to place the marked tooth of one goar between the two marked teeth of

When taking off a cylinder the connecting rod should when taking on a cylinder the connecting rod should be blocked or supported Otherwise the weight of the piston will bring it sharply against the crank case which may suffer in consequence. If the cylinders are to remain off for any length of time they should be plugged with cotton waste at all oper ings and several thicknesses of paper should be tie es of paper should be tied around the pistons

In reasonbling, all nuts boits and screws should be cleaned and clied before being replaced. Every boit has its wrench of appropriate size with which it is hardly possible to exert a breakage strain. When an 18 inch wrench is used on a % inch bolt there is every possibility of the bolt head being twisted off before the operator realizes that it is in danger

If the parts of a properly made machine do not come off with reasonable freezess when the boits and nuts

are removed force should be avoided until it is proven to avoided until it is proven to be necessary Taper pins keys and unamspected set screws are frequently re sponsible and as they must be accurately replaced their ioration and direction should be noted and remembered

It is poor policy to rush a piece of work and after a few experiences with com pression water and gasoline leaks that could be avoided texas that could be avoided by giving more time to the job in hand the metorist will hang in his shop the Go slow, go and abide by it

and abide by it
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fit grease cups to the spring
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LINING UP THE WHERLA TIMES AN INSITER.

placed on the valve stem and the holding device tached after which the wires are out.

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When the average mass finds it mecessary to take
any kind of a manches to pieces be is inclined to consider results rather than methods. He unservers all
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# COMPARES WITH THE COSTLIEST CARS AS A PERFECT SMALL DIAMOND WITH A LARGE ONE



SPECIFICATIONS

TRANSMEAD
in extension bolted to coming without noise.

CLUTCH—Multiple disc type; self-adjusting; enclosed in gear case; running in

A small diamond is relatively just as good and just as valuable as a large one. In the same sense the Hupmobile is precisely as fine as the largest, the best and the most expensive cars made. We make the compenson because we want you to learn to associate the Hupmobile in your mind with the finest cars you

The Hupmobile claims the right (and that right is conceded by discriminating owners) to travel side by side with the best products of motordom

best products or incorporarial it confesses no delinquencies, admits no inferiorities; concedes no advantage save size and carrying capacity, to cars costing twice and thrice its price.

Observe the personnel of its ownership

The control of the same and thing its process. The same and thing its process and thing its process. The same and the majority of men who drive a Hupmobile are the men who know good cars—whose private saring, perinap, houses several fine cas of other types. The same is a same in the majority of men who drives a same in the majority of men who know good cars—whose private saring, perinap, houses several fine cas of other types. The same is a same in the majority of the same in the majority of the same in the same at t made. Clip the coupon and send it now As an object lasers, three Hope the Grand Control Palace Show.

oblim were driven through the biting winter weather and deep moon, from Detroit to New York for

### **HUPP MOTOR CAR COMPANY**

DEPT. Q.

DETROIT, MICH. Addn

These things (which are literally true) will explain to you what perhaps, you had not understood before—why you have encountered in the year past so many enthusiastic partisans of the Hupmobile

ENGINE—4 cylinder, 20 H. P., 3% inch bors, 3% inch stroke; L-head type; water cooled; offset crank shaft; fin bladed fly wheel in front; Parsons white broams bearing; noiseless cam shaft. TRANSMISSION—Selective sliding gears in extensions belief to crank case; shift-in extensions belief to crank case; shift-

Everybody, if you will stop to think back-ward a little bit, has seemed to say kind things about the Hupmoble. They have said these things about the Hupmoble because it is the newly good kind of a moderate sized car which we have just described

have just described. A year ago there were less than 100 Hupmobiles in commission. Today 5,000 are being built, as rapidly as oscielence of workmanhip with the finest demand which sprang up in incredible yed-ume before the first hundred cars were completed. Of course, you want to know all about a car which has been favored with the warmest approved ever extended by the motion of the motion of the product of

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Even if you own a car to which you are
strongly attached, you would like to have
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which will shed light upon a condition so
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And if you are wavening in your choice of a car, your desire to know is even stronger

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#### Scientific American

AUTOMOBILE NOTES.

Undoubtedly the weak points in the pneumatic tire whether it be that of a cycle or motor vehicle, are its cost of up-keep and liability to puncture that the direction in which improvements have been made is in the thickening of the tread, so as not only to render punctures less frequent, but also to give the tire a longer life, and thus save expense. In som-makes of tire, the increase in thickness of the treaof the outer cover, and in others that of the inner tube has been so great that most of the resiliency has been lost, and the tire practically becomes a solid one order to restore the resiliency, it has been proto reduce the air pressure in the internal tube, but this causes not only excessive internal friction between the inner tube and the cover, which is in any case difficult to avoid sitogether, but also produces a large flat surface, in contact with the road, which adds con siderably to the tractive resistance, especially when the surface of the road is soft. The evils of traveling on slack pneumatic tires are known to all cycle riders and are (arefully avoided by keeping them inflated and are (Arinn) a routed by arming them instances with a sufficient air pressure which it is necessary to maintain in the inner tubes of the pneumatic lires of a heavy vehicle is not less than 100 pounds per square lach, and should the slightest defect occur which allows the air to escape, the tire is not only rendered useless to support the vehicle but is speedly damaged if the collapse is not quickly repaired

At the Tenth National Automobile Show in Mad At the Tenth National Automobile Bhow in Madison Square Garden there will be the only complete motor cycle cabibit in New York in 1910 by the Motorcycle Manufacturers' Association An inspection of the new models on display there proves that the motorcycle not only is a pleasure vehicle for poor and rich alike-ranging in price from \$100 for the small single-cylinder machine to more than \$500 for the expensive four cylinder touring model de inse-but a utility vehicle as well General refinement seems to be the tendency for 1910 Many improvements have been made in spring forks as the result of hard road contests during the past year Some of the machines appear with apring frames and longer wheel base, all of which make for the comfort of the rider. As regards the ap-pearance of the motorcycle better quality and more lasting enamel as well as heavier plating seems to be the aim of the manufacturers. Handlebar control is practically universal, and magneto ignition will be more practically universal, and magneto ignition will be more popular than ever, several of the makers kaving decided to make this type of ignition standard couplement, instead of optional as herotoforn Increased power apparently is a general tendency, and mechan rical ollers are also in evidence, which oliminate guess-vork is lubrication, one of the bugbears of riding Several of the manufacturers have decided to aboilish the number cutous which, with the number improvement noticeable, should make the motorprive of 1910 nt a steed as its forerunner, the bicycle.

Two Chalmers-Detroit chassis models will be manusctured in 1910, the "Thirty" and the "Forty," both both ractured in 1810, the billing and the Porty, both a continuation of those presented for 1909. The clanges, while important, are not in any case radical. The new Chaimers-Detroit 'Thirty' will have a 115inch wheel base, three inches longer than the 1909 Forty It will have 34-inch wheels—two inches Forty It will have 54-inch wheels—two inches larger than last season. The hood will be three inches longer and two inches higher—in keeping with the harger body. The 'Inhirt' motor is more powerful but year than its Tan 1010 'Forty has a 122 inch wheel base—ten inches longer than last season. It has 36-inch wheel, and room for seven passengers. The 1969 where, and room for seven passengers. was a five-passenger car

The Tenth National Automobile Show in Madison Square Garden eclipses any former exhibition of motor cars, motorcycles, and accessories ever held in the famous building. There is a total of 323 different the Amous building There is a total of 333 different displays, of which there are 3 exhibits of complete care besides 246 exhibits of accessories and parts, and 71 motorycle exhibits Fress with an increase over last year of more than 7 000 feet of exhibition space which the show managers by ingestions mathods were shit to the out of tha Garden Interface, there is not not tool to must game a variable for exhibition purposes. This situation is indeed a striking commentary on the growth of the industry when it is realised that at the first automobile show in this country, in 1900, there were only 60 exhibitors who displayed their product in the Garden

Noteworthy among the runabouts costing much I than \$1,000 is the Hupmobile made by the Hupp Motor Car Company Detroit Mich In its constrskers have endeavored to impart to their tion too masors have conceived to impart to their runabout all its stanniness carcilient workmassin, and trustworthiness of the seven passenger touring car. The four-yillnder eagint is of 20 hone-power, with four cylinders having a stroke of 3%, inches and a hore of 3% inches. Water cooling is supplyed. The trustmission is of the selective sliding goar type. The multiple disk cittach runal is oil. The pure sale is shaft driven. There are two foot brakes and two. brakes. A Bosch high-tension magneto is

Something new in the Carden show is to be found in nearly every one of the models exhibited. Some the new points of interest are found in axies, anazumentons, and in inbricating systems. In bodies, transmissions, and in inbricating systems. In bosses, a type that seems to be gaining favor is the four-passenger surrey, which is but a tonneau without doors, built low in the back and idea, yet providing plenty of senting space. The cars at the Garden show range from the occultent on the market down to the lit-tle runshout that is cheap smough for anyons.

In 1901, Mr Byron J Carter, then of Jackson Mich, realising the shortcomings of geared trans-missions as used in automobiles, began experiments for improvements, being naturally attracted to the friction system because of its manifest advantages After months of careful research, the first Carteron After months of careful research, the first Cartervar rickine-driven automobile appeared in the summer of 1903. This automobile was of the runsbout type, and in addition to the radical improvement in transmission parts, was well designed and constructed. The car has run more than 25,000 miles, and is now, with out repairs, apparently in condition for

A remarkable car has been brought out up un Schaoht Manufacturing Company, of Cleveland, Olih The car in question is imprincing convertible Or dinarily it is a runabout. By the addition of a curre seat the runabout is transformed into a four-passenge and the company of the co arkable car has been brought out by the al box back, is converted in o a light delivery The vehicle is illustrated on the double page of cars appearing in this issue.

The present four-cylinder Cartercar may be regarde as an improvement of the former two-cylinder me without a single radical change. This car will appear in the coming season in two sizes. Both have the Car-ter friction transmission, the nucleus around which the first Cartercar was built

The most grueling sort of endurance contest in which motor cars have participated are 24 hour races As a rule out of about fifteen cars sta events only five of them finish at all, the remainder events only five of them finish at all, the remainder breaking down in the ocurse of the contest from some mechanical weakness. Bonse cars have started in sight or more of these terrific grinds and have never finished once. At the 28 hour race beld at the A Y P Expedition at Seattle, a Hudson "Ywenty" stock car weep around the course for hours at a time making mile after nile with the utmost consistency in a 1 15 clip The construction of this car is interesting, its low selling price is considered. The rear at d The rear axie is of the semi floating type, shaft driven, and is strong; reinforced at the points where the greatest shocks and strains occur Two large double-acting brakes are d at each end of the rear axie built for the man who is satisfied with a speed of 55 miles an hour The motor, four-cylinder vertical, water cooled, is simple, very strong, and amply powwater cooled, is simple, very strong, and erful The transmission is the three-speed selective type used on all standard cars.

official Reteorological Summary, New York, N. Y., December, 1909.

Atmospheric pressure Highest, 80 49, lowest, 28 97, Atmospheric pressure Highest, 80 49, lowest, 28 97, mean, 39 92 Temperature Highest, 54, date, 6th, lowest, 8, date, 30th, mean of warmest day, 45, date, 6th, coolest day, 115, date, 30th, mean of maximum for the month, 36 8, mean of minimum, 96 1, absolute mean, 31 4. normal, 34 1, deficiency compared with th mean of 39 years, 27 Warmest mean temperature of December, 42, in 1891, coolest mean, 25, in 1876. Ab-solute maximum and minimum of December for 39 soute maximum and minimum of December for 31 years, 65 and —6. Average daily access aline January 1st, 07. Precipitation 5.00, greatest in 24 hours, 282, date, 12th, 14th, average for December for 38 years, 348 Accuminated deficiency since January 1st, 287 Greatest precipitation, 686, in 1884, least, 695, in 1877 Prevailing direction, west, total movement, rrwaining sirection, west, total mevement, 11,944 miles, average hourly velocity, 161; maximum velocity, 58 miles per hour. Weather Clear days, 14, partly cloudy, 8, cloudy, 9; cu which 0.01 or more oprecipitation occurred, 6 Siset, 18th Snow-fall 114

Many an inventor has probably wondered whether the patent law forbids his experimenting with a pat-ented invention. The answer is: It all depends upon the ested invention. The saswer is I relia depends upon the character of the experiment. Suppose that an inventor is interested in fying machines, and that his primary object is to improve the Wright machine. He has be the privilege of building a Wright machine himself and fy-ing it, in order to study its performance as well as to acquaint himself with the art of fring! We high: acquaint numbers with the art or nying? We think not. He has no right to build the machine for the purpose of learning how to fly or for studying its performance in any way. Had be besent the machine from the Wright brothers or their licessees he would ubtedly have the right to use the m

fantani va tojo,

1810 Registrations and Escapetal Insumed as considerable doubt, and in some constraint, some to grim in report to the 1740 regist tens and lonness in different State, the Burean Tours of the Antomobile Club of America has not a chart showing just what States require reg a chart anowing part was according to provide the confidence or license for the new year, where spacewis are hepensary, and where the old registration or license is skill operative. A synopole of this chart for New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, and Rhode Island is as follows: New York.—Registration of cars in New York

are perpetual on the car originally registered. If our changes ownership, the new owner must re-register same. If new car is purchased, same must be regis tered. Transfers are not made.

New Jersey -Registration of car and driving liou

New Jersey --Ragistration of our ann criving plombs is required annually, and same can be procured direct from the Bureau of Tours of the Otub.

Pennaylvania.—Pennaylvania requires both registration of car and driving license annually, application bhanks for which can be precured from the Bureau of Tours. Non-residents, of States that reciprocate, are altowed the desert examption from perfects the property of t

Tours. Non-residents, of Hates that reciprocate, and allowed ten days' exception from registration. Massachusetts.—Registration required annually; also driving license for owner and chauffour Owner's driv-ing license perpetual; chauffour's driving license good ing license perpetual; chausfeur's driving license good for one year from date of issue—the latter renewed for 10 cents Non-residents scenpt for seven successive days Non residents owners may drive, but chastifeurs must procure driving license. The Bureau of Tours can procure temporary driving license for non-resident chausfeury, provided chausfeur oan procure criticates of good character and recommendations.

Connecticut —Registrations are annual, expiring D combertell registrations are annual, assuming to comber 31st Annual driving license required by owner or chauffeur Non-residents exempt for ten days from registration and driving licenses.

Rhode Island —Registration and driving license re quired Fees of registration based upon horse-power Non-residents duly registered in home State are exmot for ten days.

Ricetron—A Metal Lighter than Alquaintum. According to Kosmos, a technical review appearing at Pforzheim, the Grissheim-Electron works exhibited at the aeronautic exposition at Frankforton-the-Main its novel patented alloy, the metal "electron," which is claimed to be much lighter than aluminium and at the same time much more durable.

lightest metal employed for technical pu up to the present time has been aluminium and som alloys of aluminium, the strength and the du of which are however lower than those of the new metal. The density of aluminium and its alloys has been nearly 3, and they are about twice as heavy as electron. The chemical works of Griesheim-Electron has discovered that magnesia is utilizable for technical purposes. By the admixture of magnesia, the pric of which is comparatively low, with one or two metals an alloy is produced of a density of 175 to 2, possessing great solidity, strength, and elasticity, and at the same time readily workable. The color of these alloys esembles that of silver, and they possess great so rous quality

rous quanty

The new metal is said to behave very well as regards change of temperature, and it responds to all
technical requirements, in the sir it becomes covered
with a coating of protective oxide. As east metal, it
oftens a resistance up to 18 kilogrammes per aquare millimeter and has at the same time an exte

useful in the construction of simple and automatise insumeds as in most of its proporties it is superior to aluminum and its alloys. In manufactural the same object, one work require at least to pic questions of electron than of aluminum. The "Expelia" airning requires 4,600 histogrammes of aluminum, which costic to replaced by 5-50-kilo-grammes of electron. A large association contribute for mechanisms of electron. A large association contribute for mechanisms, when the fill interpretation of the contribute of the political of the property of the political of the contribute of the political of the contribute of the political o

THE MOTOR CAR AND THE READ.

(Continued from page \$7.) out binders include the potro manust opposts memore the port-one containing an apphaltic best, the sides of such petroleums, the heavy s, pitches, and numerous oil, tar, and shalt preparations. In addition to se, a few special materials have been se, times, a new special materials have been the suffect of experiment, such, for ex-sumple, as the wasts product from the best and case sugar factories. In some instances give and bichromate of potash have been added to oil or tar emulsions to cause the residue upon the road surface to harden after the volatile products have evaporated. Waste sulphite liquors from wood pulp have been employed with rron wood pulp have been employed with some success in a concentrated form, and, in fact, the list might be indefinitely extended. The essential requisite in a dest preventive is its bluding power, and it naturally follows that the experiments will cover a wide field.

Water, while small the most above.

Water, while usually the most abun and cheapest material, is very often, be-cause of the frequency with which it must ed, the most expensive to us be applied, the most expensive to use. Its binding power is almost entirely due to capillarity. The value of the sait solu-tions commonly used lies in the hygro-scopic character of the dissolved sait, which, having considerable affinity for water, keeps the read surface in a moist condition long after a surface treated with water alone would have become dry through evaporation. The light oils and tars, as well as the oil and tar emulsions. are dependent for their effect upon the retention by the road surface of a comparatively small amount of true binding bee tively small amount of true binding base after the volatile products have evapo-rated. This base proves effective only as long as it rotains its binding power is When the binding power is destroyed, it is necessary to apply more material. If the base is an exceptionally good one, the accumulated products finally harden the road surface and prevent wear to some

The heavy olis and tars differ from the lighter products in that they contain a much greater amount of asphaltum, which much greater amount of asphantum, which constitutes the binding base. The results are, therefore, of a more lasting charac-ter, and hence the name permanent bind-ers. The semi-solid and solid prepara-tions usually contain a still greater tions usually contain a still greater amount of binder With some few ex-ceptions, all of the true binders are bitumens, and these bitumens may be ofther natural or artificial

matural or artificial The usual method of applying these ma-terials to the road surface is by aprint-ling. The temporary binders can usually be applied cold, but the permanent bind-ers, because of their much greater vis-cosity, must be heated until sufficiently finld in England and France the use of finid In England and France the use or coal tar is practised to a large extent and their methods of application have been highly developed. Machines are in gen eral use which are self-propelling and in which the tar is heated and then applied which the tar is heated and then applied to the road surface as a spray under high pressure. These so-called "far sprayers" are not only very economical in the use of tar, but insure a more even distribu-tion and better penetration of the road surface than it is possible to obtain in

almost any other way.

In the construction of dustless roads, the crucial question is that of cost. Autoobiles have but little destructive effect mobiles have but little destructive ensert on payements, but these are in general too costly for country roads. The effort must be to develop a form of construction which will withstand fast automobile and at the same time be within the financial reasonness of the community. This is largely being gions at present by the set of a bituminous binder instead of the rock dust. The two methods generally employed are known as the possersation and the mining method. In the former, the bot liquid binder is sprinkled or servered over the stones and allowed to passersate through the vedic hast once the stones small by an doubt of two or three biness bandlers has charged and surface of the reason small by an doubt of two or three biness had been also the read surface by means of home of several severance. In the michine case the more of severance, in the michine of heavy of promise. In the mixing



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BASED ON FACTS
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Deving the past erasm? have dream my car good miles by the adometer, averaging approximately non-miles a work. My caparions has shown that this car can be run 5,000 miles a year at an overage latal cost of 5 of a week.

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#### CHEAPER THAN TROLLEYS

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Kingstand Point, M. Y.

method, the stones and hinder are thoroughly mixed, either by hand or machine, sugnly mixed, either by hand or machine, so that each stone is covered with a thin film of the binder. This method in gen-aral insures the better and more even dis-tribution of the binder throughout the

very largely with different sections. In England and France the tars are used very largely. In the western portion of very largely in the western portion of the United States, the heavy asphaltic offs of California are used almost exclu-sively, while in other sections we find that tars, residuum oils, liquid asphalts, and various proprietary compounds are

One of the chief causes of the gree number of failures which have been re-corded in the use of bituminous road ma-terials is the failure of the user, as well terials is the failure of the user, as well as manufacturer, to understand certain fundamental principles. To many, a tar is simply a tar and oil an oil, while in reality there is a wast difference sometimes even in the tars produced at the same works. The oils also range from those of a paraffine base to those almost wholly asphaltic Thus a concise knowl edge of the character of the product, the process followed in its preparation, and the affect which varying conditions will have upon it is necessary in order to avoid costly mistakes.

### THE MIDDLE WEST AND THE AUTOMO-

(Continued from page 48) that the freight has usually been added to the purchase price of the car, and many cases in the past, and there will be many more in future, where the cars are sold directly at the catalogue price. For that reason, the location of factories in the middle West was ideal, for it is in truth the center of the automobile-buying

In some cases, cities have been made over and their population doubled and trebled by big motor-car factories, as in the case of Flint, Mich, and New Castle, Ind. Such cities have had a tremendous boom in real estate and in husiness gen r, owing to the influx of 2 000 fo families, and have assumed an entirely dif ferent position on the map because motor-car factories were established within their limits Besides supplying employment to laborers in large numbers, much money has been made by the leaders in the vari-ous enterprises. This has been especially true among the makers of wheels tires, frames, and other parts in a general frames, and other parts in a general way it may be said that the parts mak ers have made more money than the auto-mobile builders, as the latter have ex pended greater sums of money in experi

The total capital of the automobile manufacturers in this country is about \$225,000,000 The actual value of the plants will run into some extraordinary figures, and these values are rapidly oreasing As for the output for 1910, it is likely to exceed 200,000 cars, although there may be a slight failing off from these figures, owing to the inability of paris makers to supply the demand There are now about 150,000 automobiles in use in this country. In a general way, it may be said that the employees num it may be said tast the employees hum ber some 120,000 fm motor (ar factories with employees in parts factories reach ing not less than 40,000, a total of 160,000 America may be safely considered the home of the low-priced car, a condition nome of the low-priced car, a condition brought about by the tremendous buying power of the middle classes, who demand a car which can be cared for by the owner without the aid of an expensive chauffeur

These low priced cars have been made ossible by ideal factory methods and big production This recognitated their being standardized, something that may be said to be original with the American maker, who feels that any one of ten thousan parts should be made to fit any one car turned out by his company

By working on big productions and

### THE KNOBS WILL STOP YOUR SKIDDING



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BRANCHES, AGENCIES OR DEALERS EVERYWHERE

that the American maker will sconer or later figure in the foreign trade. This is particularly true in connection with the been neglected by the foreigners With have been developed many new captains of industry, who as pioneers have biased certain to be important factors in future

(Continued from page 51). It is in many applied to the construction of the current consumption. This arrangement is a reconstruction of the current consumption. This arrangement is a reconstruction of the current consumption. This arrangement is a reconstruction of the current consumption. This arrangement is a reconstruction of the current consumption. The current consumption of the current consumption of the current consumption. The current is a province to the current consumption of the current consumption of the current consumption. The current consumption of the current consumption of the current consumption of the current consumption. The current consumption of the current consumption of the current consumption of the current consumption. The current consumption of the current consumption of the current consumption of the current consumption. The current consumption of the current consumption of the current consumption of the current consumption of the current consumption. The current consumption of the current consumption. The current consumption of the current consumption. The current consumption of the (Continued from page 51)

seeing priors down, there is little doubt there is noise there is friction, and contact the American maker will sconer or sequently where there is friction there is must the chains will run bidees is on the second also, the westric brake which and the American maker will sconer or sequently where there is friction there is must the chains will run bidees is on the second also, the westric brake which and the second also, the westric brake which as the second also, the westric brake which and the second also, the westric brake which as the second also, the westric brake which and the second also, the westric brake which as the second also, the westric brake which as the second also, the westric brake as the second also, the westric brake as the second also, the westric brake as the second also, the second also close to be inseparated as the second also close to be inseparated as the second also close the s It is found to-day on every high

necessary factor in the construction of electric automobiles. For this reason the

The inside power carried in discussion, and interest of the in

brakes.

Tires influence the performance of an electric automobile more than may be imagined Various designs of tires show a variation of up to fifty per cent in efficiency, so that the speed per single charge of the battery is affected. Speedial points to be borne in mind in the care of manuscript fifty are that runs as well as pneumatic tires are that rust as well as oil is very detrimental to them, and that oil is very detrimental to them, and that it is necessary to keep tires well inflated. It is necessary to keep tires went innaces.

If the storage battery of a few years
ago be compared with the up to-date battery, it will be found that a very much



### HOW TO OVERHAUL A CAR

(Continued from page 58) on for this is that the shafts, es son for this is that the sharts, es-pecially gran shafts wear down and noust be ground true and no manu facturers seem to appreciate the useful ness of boring repair bushings slightly under size The pilot bushing being solid must be specially made to suit the shaft Aside from this one a skillful amateur Aside from this one a skillitul amateur can make a good job of scraping his own bushings if he has a suitable set of scrapers and time and patience. Red icad is used to test the fit. Of course the gear case n ist come out of the car and at intervals the bushing caps are boiled down tight and the shaft turned to de termine whether it is tight or free and whether it makes contact all over

whicher it makes contact all over in refitting gear shafts and bushings it is necessary not only to achieve a proper fit but to keep the shafts abso-utely parallel. If they are not the gear teeth will not bear squarely across their tecth will not hear squarely across their far but will wear away at their con ners as raggerated in the dotted por tions lig 4 In the matter of gear replacements the

In the matter of gas replacements the best result is naturally gained by replacing b th mating goars if sither is badly wors aim othersise the new pears would have to run against a bad profile and would west away sooner. If the car has sid thain drive the differential shart bushings will need rediffing at the same time. The parts of a differential which war fastest are the bushings A of the squ or bevt, platons R (Fig. 5) since these are the fareds; things to tubricate these are the fareds; things to tubricate these are the hardest things to lubricate To take the differential agart it may be nicessary to file the ends of braded over came the nuts should be reduced in thick tame the nuts should be reduced in thick nuss so that the holts can be headed over again on reassembling (The bolts in hig r do not go through) It is very important not to give anything about the differential the slightest chance of work ing loose and the same applies to the bolts holding the change gears. Another point that is difficult to oil and therefore the differential or gear hub and the sleev into which the hub of the differ ential shell extends This sleeve runs in plain or ball bearings in the case with the shaft or gear hub turning inside of it whinever the car goes around a turn Booner or later new bushings are ne eded

If oil is used in the gear case as it must be if piain bushings are used in stead of ball bearings it becomes some-thing of a problem to lubricate the bear ings effectively without excessive leak age of oil the witti solders a thin wire gauss streen (Fig f) over the interior oil pockets to exclude steel grit worn from the grars in order to prevent es cape of oil from the ends of the bush ings a felt ring is necessary (Fig 6) This ring would cause the oil near it to become stagnant were it not for a specia obscious sanguant were it no in a special solid groove & which should be chipped en tirely around the bushing and connect with a groove ( by which oil entering it may return to the interior of the case But for this provision partitles of dirt tting into the end of the bearing would accumulate and cut the shaft

In the rear axle of a shaft-driven can the thing most likely to need replacement is the differential i bere are various ways of getting at it depending on the design of the axio casing. If the axie is divid d vertically in the fore and aft central plane the rear springs must be in kid 11 and disconnected from the axle haives of the axle drawn as after taking off the wheels. A better ar rankement is to have a removable cover plate on the asing through which the differential is instited and withdrawn This is found especially in axies of the rais is round expectany in axis or the floating type with wheels running on ball or roller boarings on the ends of the axis tubes and driven by floating shafts extending from the differential to jaw of lutch plates (neaging the outer ends of the wheel knubs To remove the diff ferential the hub cape are first removed



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ed the senting sh the differential without facility the straps holding form the tial are removed, the bereit

OR.

Unless a oar is more than one year it is not necessary to assume that the ferential needs overhauling. By jack one rear wheel and ro up one rear wheal and rocking it blick and forth, the total angenis of sleck in the differential may be estimated. It is also usually possible to reach the platens through openings in the differential shell, and by shaking them to determine whether they are loss. If yo, they should be rebushed and the plate or spilor re-placed at worm. Prespective posses are placed at worm. Prespective posses are placed at worm. Prespectively posses are placed in worm of the platent place of the contract of the platent placed in the platent place of the platent placed in the platent plate ing pinion or gear or both to compensate for wear If this adjustment is disturbed the gears should be moved in a straight the gears anouse he moves in a straight line and not canted ground, alse the teeth will engage only at their small or large ends instead of over their full length By rubbing red lead on the teeth and turn ing the gears, one can tell where the

teeth touch
if cup and come ball bearings are used
whether in the rear axis or in the transmission any worn parts should be renewed immediately Fig 7 shows the
effect of wear on a stationary ball come, effect of wear on a stationary ball come, o g on an axis spitable. The pressure comes against the stationary bottom por-tion and white the cup wears a true path the come is destroyed. It is possed ble though not always worth while to prolong the life of the cone by giring it a quarter or half turn on the shaft or axis. It is, our is stationary and the axie If the cup is stationary and the cone rotates evidently the cup will be the first to wear out of round When one ball of a set is renewed the entire set should be replaced with it

We come now to the engine the last we come now to the engine the last and in some ways the most difficult part to overhaul The owner is strongly ad vised not to attempt to refit the main vised not to attempt to refit the main crank shart bearings unies he has had considerable previous experience and shows exactly what to do not be other hand it is not at all hard to regrid and it is not at all hard to regrid and lifters and their guides and to do or dinary tinkering and adjusting with the timer arabrurer et al. It is best not to tamper with the magneto further than to clean the interrupter and adjust the interrupter collate joints if wors to fall small pear. This off the magneto first marking the coupling so that it can be replaced exactly as it was and tag the

be replaced exactly as it was and tas the no replaced exactly as it was, and tag the wires Remove and tag the oil pipes, blow through them to see that they are clear and plug them to exclude dirt Disconnect the carbureter remove the timer take out the spark plugs and plug the holes with waste remove the dust pan take out and mark the valves take off the water pipes, the pump, and the fan Now take off the cylinders If no further dismantling is contemplated the piston heads may be scraped in situ tak ing care that none of the carbon falls into the crank case and the piston rings are likewise cleaned without removal if ible If the rings are leaky as prove

possible if the rings are leaky as proved by failure to hold compression when the valves are tight new rings are put in and fitted to the locating plan which prevent them from terming. At the same time the outbon can be scraped from the in side of the cylinder heads.

Take down the oil pass Twet the fit of the virties plan and create plan bearings by one to be supported by the cylinder heads.

The form the plan is the contract plan bearings by the contract plan and create plan bearings on the plan. Do not confine a redding motion due to loose fit with and play on the plan A cortain amount of end play is always provided A creake pin bushings in likely to were contical (see shaded is always provided. A crain pin bushing is likely to wear control (see shaded area) if the rod is offset as in Fig. 8, and if the rod is springy the bushing may wear bell mouthed at both each. The crank pin itself will in time wear dar oranz pm reser will in time were that at the point of greatest presenting, as indi-cated in Fig. 9. It takes more skill than can be acquired off-hand to true it up again, but it can be done with a fine

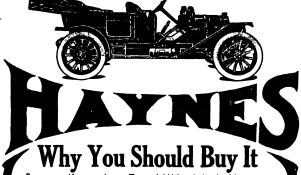
Swiss fits and calipers. It is not neces-sary to fits clear around the unworn por-tion of the pin, aince a slight devis-tion from its original axis does no harm, neither is it absolutely essential that it should have the same diameter through out. Its new axis, however, must be ab-solutely parallel to the shaft. It is best new, taking out or inserting shims till a fit is obtained, and scraping no more than is necessary. A worn wrist pir bushing must be renewed, and usually the wrist pin must be ground true II the crank pins are oiled through passages drilled in the crank shoft, their lubrica tion' is probably perfect. If, however they are olied solely by splash and the oil holes are in the upper half crank pin bushing, a considerable im-provement can be made by replacing the upper bushings with solid ones and in upper bushings with solid ones and in troducing the oil through the bottom half by brasing a copper tube in the cap to act as an oil scoop (Ng 10). The bot-tom half is then drilled and provided with an oil groove for about half its length it is a principle of tubrication that the oil should always be introduced. at the unloaded side of the journal and that any breaks in the continuity of loaded surface merely afford the oil an

To renew the ciutch leather, take off the old leather and use it as a pattern Select the new leather carefully for uni form and correct thickness, and cut it about half an inch short. The curvashout half an inch short ture should be approximately that of the old piece (Fig 11) Locate the end and the middle holes for the rivels countersinking them considerably so the rivet heads will not come flush, and soak the strip in water till it has swelled suf-ficiently to go in place. Use the end of a steel bar as an anvil, and put in the end and middle rivets first, holding the strip and gitture rivers min, notding the strip meanswhile by wire nails. The riveting must be completed before the strip dries

### AUTOMOBILE FIRE-ENGINES

(Continued from page 55) gine proper After reaching the fire engine proper After reaching the scene of the fire the driving gear is uncoupled and the pumps are put in con nection with the engines. Such fire en gines of course must draw their water gines of course must draw their water from a hydrant, well, or other supply They have done splendid work in au burbs wherever fire engines of suitable power or an adequate high-pressure sys-tem can be held in reserve The best a crew of seven men at speeds up to 60 miles por hour and carry 1,000 feet of nose The pumps deliver 700 gallons of water per minute at pressures up to 150 pounds to the square inch. The regular to the square inch steam fire engine has a capacity vary-ing from 400 gallons per minute to 1,000 gallons in the case of the largest size of machines. Such a motor fire engine usu-ally contains two 3-gallon chemical exmacrones. Such a motor are engine une-tinguishers, and heavy suction hose for hydrant connection, fire axes, nonsis-heders, large slarm belt, the usual equip-ment of famps, hancers, tools, and small saling ladders. In the opinion of many fire engineers a suburban fire station with possibly a some engine in reserve Again, ricam engines may also be bid at reserve stations instead of a large number of single steamers. This means considerable socomy in the purchase, optipment, and maintenance of a fire action and the posed of the nucleus ac-able efficient survive to be readered. Finally, we may consider machines in which no essential change is made in which no essential change is made in

their construction except to use the gr their construction except to use the gaso-line motor and means of propulsion in place of the usual horses. Typical of these are the large combination hose wagons and chemical engines which uses are the large combination hose wagons and chemical engines which carry 1,000 feet of 3½-inch fire hose and answer every purpose of the horse-firm wagons which they are destined to supplient. Fuel for 150 miles can be spirited in the gasoline tauths and spoofs.



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sure service

Nor is the use of the automobile can in instance of most free apparatus claim. The sure of the surery my anoma chemical that the evolutilise of maintenance more virial balder frucks up in 55 ford in lacing the surery of the su can be turned in its length around cor ners and is often more castly controlled and regulated than with horses besides being capable of running 25 miles per hour with full equipment and erew on of operation is secured as well as re a five per cent grade. This apparatus liability of service, then with the extra

considerable efficiency
That the motor-propelled apparatus is
bound to come eventually and to supplant house-drawn machines seems to be the opinion of progressive fire fighters. Chief fighting power is desired first of all, in fighting power is desired first or sat, in nearly every large city department, the chiefs prefer heavy units to increased mobility and speed. On the other hand

a 49 horse power four-yillnder automo- is inconsiderable and that furthermore bit the automobile taking the places of the best fire relatives are now supplied the forward wheels thus making a six with rubber tires, so that there would be wheel while slightly longer than the in more wear in one case than a lordinary ladder trutk with its horses, the other Fire engines, owing to their but sterend by a liftle wheel the her rear portability and the speed with which in the same manner. The whole machine littles will be speed with which the same manner. the best fire vehicles are now supplied with rubber itens, so that there would be no more wear in one case than is the other Fire engines, owing to their pertability and the speed with which they must be brought to full working ca-pacity, are notoriously inefficient ma-chines from a mechanical standpoint, and the gasoline engine in no way works for worse conditions. If reasonable economy

ordinary decrease in the cost of mainte-nance the gasoline motor-driven machine is bound to have a successful future

#### ARTI JOY RIDE DEVICES.

ANTI OF BIDS BEYGER.

(Condissed from page 1 head for space of actechnicate fastened inside the head for 
the case of the car by means of actechnicate fastened inside the head for 
through the dash, which are inaccessible 
until the hood is raised, the Corboards 
can be secured against removal, and 
this will make it impossible to open the 
cover of the gear box Furthermore, 
there is combined with the lock a wirethere is combined with the lock a wirethe vehicle

proof against tampering seems to have been taken by the inventor, who asserts that it is impossible to start the engine,

hood These cables lead to two special spring latches secured to the lower inner corners of the dash in a position to en gage the slots cut in strips of angle from riveted to the inside of the hood on either side. Thus, when the key and cam are in open position, as shown in the drawing, the latches are withdrawn and the hood can be raised, but when the switch has been turned to 'off" and the key the bood against all attempts to rates it The engines may be run with the ho open, and the hood will lock automatic

In a special recess directly beneath Yale look is placed a vibration rec er, resembling a pedometer in appears er, resembling a pedometer in appearance and action, which is held securely by a plate provided with a spring to press against the back of the instrument. The without it is also inspected the service of the ser

lever, and the switch cannot be operation without it. It is also impossible to remove the key until the switch has been traved to 'our' position.

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(Continued from page 70)
then be suspended from the springs, and
in almost all cases it will cause the leaves to separate sufficiently to permit the jubricant to be introduced by means of a thin bladded table knife

CLEANING THE OILING STREET it occasionally happens that the oiling system becomes clogged, either from the blokening of the oil or the introduction

of dirt and grit.

or art and grit.

In the majority of cases this may be cleared away by draining the oil from the tank and crank case, putting a pint or two of gasoline into the tank, and or two or gasonie into the gaso-line will thus be forced through all parts of the system, and will cut out the thick oil and dirt. Before redilling the tank with oil, the gasoline should be drained out and time allowed for it to drip out

CUTTING A GARRET

To prevent the leakage of oil the cover of a gear case usually rests on a gas ket, which may easily be injured or de stroyed when the cover is removed. Its shape makes it seem a difficult part to replace, but as a matter of fact it is a question of only a few minutes work to

The material to use is smooth and un creased brown wrapping paper of me-dium weight, and of a surface that is not too highly glazed Clean the top of the goar box and lay the paper over it, then with a light hammer tap the paper where it rests on the outer edge of the flat part. The edge cuts through the pa per where the hammer strikes, and to get the gasket to proper shape it is only necessary to follow the edge all around To prevent the slipping of the paper, the for prevent the suppling of the paper, the first step might well be to cut two both holes through it, and to insert the boils. The holes are cut by striking the paper over the both holes in the gear case, using the ball end of the hammer

The finside opening is cut in the same manner as the outside Before applying the gasket, give one side a coat of red lead and the other a coat of shellac, and in placing it in position have the shellac side down, or in contact with the sta-tionary part. The gasket will then cling and will not be torn on any subquent removal of the cover

A gasket made in this way will give excellent results under the detachab excellent results under the detachable head of a marine or stationary engine, but after fitting it the engine should be run sufficiently to get normally heated before finally setting up the nuts or belts that secure the head to the cylin-

Aside from its unsightliness, a dent in tube, radiator housing or other metal a tube, radiator housing or other metal part may interfere with operation, and it becomes necessary to remove it. To do this form one end of a plere of stout copyer wire into a loop, and soder it to the lowest point of the deat. Then exert a strong and steady pull on the wire, at when the same time dapping the borders of the deet with a light hammer. When the deet with a light hammer. When the control of the death of the control of the pulled out the sodder may control of the control of the control of the control of the deet with a light hammer. When the deet with a light hammer. be melted off and the finish restored with

ne emery and crocus cloth.

A dent in a gasoline tank is more dis ficult to remove on account of the great er stiffness of the metal, but it may b er stiffness of the metal, but it may be accomplished by the use of a discarded valve Clean the valve hand with emery cloth and solder it, not to the bottom of the dent, but to one of the sloping sides. The valve stem then forms a sort of lever by which the dent may be

The copper and brass piping used for rasoline and water connections has a pasoline and water connections has a tendency to spill, and an injury of this 3650 A.B.C. Automobile 3450 and the part. This, however, in our always necessary, for a permanent and algabity necessary, for a permanent and algabity. The work is begun by winding too 14 spill popular and the spill popular and th



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of the pipe, and a half-thich beyond one end. Then, after heating and applyin soldering solution, the windings shoul soluting solution, the winnings second be soldered together and the outside windings soldered to the tubs. This will form a tight jacket around the split portion of the tube, and will save the

LINING UP THE WHERE.

While it is not generally realised, yet while it is none the less true that the failure of tires to give good service is in many cases due to the wheels being out of line. This may be caused by misadjust-ment, sprung steering-rod or arms, a twist in the axie from road shocks, all of which result in throwing the whoels out of parallel with the center line of If the wheels are set correctly, they will have a true rolling motion on the road, and the slightest deviation from the road, and the slightest deviation from this position will set up an additional sliding action that is destructive to the

In testing the parallelism of the wi In testing the parameters of that the side it may be taken for granted that the side members of the frame, as well as the springs, are parallel Starting with a springs, are parallel Starting with a rear wheel, measurements should be made of the distances between the spr and the forward and rear portions of the fellos, at points as nearly as possi on the level of the axis These measure-ments should be equal, and should be the same as corresponding measurements made on the opposite side of the car if the figures indicate that the wheels are equally out of parallel with the springs.

equally out of parallel with the aprings, matters may be set right by making a proper adjustment of the radius rods. To test the from whoels, manipulate the steering gear until measurements show one wheel to be parallel to its spring, it will be necessary to adjust the drag link, which is the bar connecting the standard arms of the tray lamables. the steering arms of the two knuckles.

Another method of testing the wheels is to stretch a string along the sides of a front and rear wheel, just above the axle. With the steering gear set for straight running the string should touch each wheel at two points, as indicated in the diagram If the wheels are not true, the string will touch at one point only, as illustrated

The writer was once called on to lozaie a knock in an automobile engine belonging to a doctor There was no ques-tion as to the cylinder, nevertheless even the use of a stiff wire, one end held in the teeth and the other resting against the engine, failed to determine whether the trouble was in the crank pin or wrist

The sight of a stethoscope in the tor's pocket suggested its use, and the knock was immediately located in the knock was immediately located in the wrist pin. A stehencope now takes an important place in the writer's testing equipment, and he believes that it will be found invaluable in the repair shop by its use locensees in a bearing may be detected long before it becomes service, again again when the becomes service, again again was be should be a supported with the state of an intelligent was the state of the

TIMING MAKE-ARD-BREAK IGNET

THIND MARKAR-BRAK FORTHMAN. Under usual conditions it is difficult to time ignifers with any degree of accuracy, but it may be accomplished with entryfrising sease by the use of an electric ball, a battery and wire. One side of the battery is to be grounded, the other continues to the bell, and the circum continues to the bell, and the circum continues to the bell, and the circum continues to the bell, and the part of the continues to the bell, and the processing the continues to the bell circum continues to the bell circum continues to the bell circum continues to the part of the part o advery, New York

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The name of the car was the Overland And the price—then \$1,250—was as amazing as the car itself

The sale of this car spread like wildfire Each car sold brought a call for twenty others like it. Old and new motor car owners came by the score to deposit advance money—attracted by the Overland's matchless simplicity

But the cars did not come And when Mr Willys went to the makers he found them on the verge of receivership.

The genus which had created this marvelous car could not finance the making, in the face of the 1907 panic.

#### The New Start

Mr Willys in some way met the overdue pay roll—took over the plant—and contrived to fill his customers' orders.

Then the cry came for more cars from every place where an Overland had been sold. As the new cars went out the demand became overwhelming. The factory capacity was outgrown in short order. Then tents were erected.

Another factory was acquired, then another, but the demand soon outgrew all three.

During the next fiscal year these factories sent out 4,075 Overland cars. Yet the demand was not half supplied.

Dealers fairly fought for preference. Buyers paid premiums. None could be content with a lesser car when he once saw the Overland

All this without advertising. About the only advertising the car ever had was what users told others

#### The Pope-Toledo Plant

Mr. Willys' next step was to buy the Pope-Toledo factory—one of the greatest automobile plants in the country. This gave him four well-equipped factories—just 16 months from his start.

But the Toledo plant wasn't sufficient So he gave his builders just 40 days to complete an addition larger than the original factory

Then he equipped these buildings with the most modern machinery—with every conceivable help and convenience—so that cars could be built here for less than anywhere else

Now 4,000 men work on Overland cars The output is valued at \$140,000 pxt day The contracts from dealers for this scason's delivery call for 20,000 cars

Now this man has acquired 23 acres around his Toledo plant And his purpose is to see from this time on—that those who want Overlands get them

#### Marvelous Sales

Dealers had ordered 16,000 of the 1910 Overland models before the first car was delivered. That means that each Overland sold the previous year had sold four others like it.

And without any advertising.

This year's Overland sales will exceed \$24,000,000. Yet the Overland is but two years old.

#### The \$1,000 Overland

This year an Overland—better than last year's \$1,250 car—is being sold for \$1,000 That is because the tremendous production has cut the cost 20 per cent.

A 25 horse-power car, capable of 50 miles an hour, for \$1,000, complete with lamps and magneto Never did a maker give nearly so much for the money.

There are higher-powered Overlands for \$1,250—\$1,400—\$1,500. They are just as cheap in comparison as the \$1,000 model

The Overlands are unique in simplicity They operate by pedal control A ten-yearold child can master the car in a moment

They are made in the same factory, and by the same men as made the Pope-Toledo—a \$4,250 car The reason for the price lies in the production of 125 cars per day

#### Get the Whole Story

Send me this coupon to get the whole story, told in a fascinating book Learn about the ear which in two years captured so large a share of the whole trade of the country. See what has done this—what there is in the Overland to make it the most desired ear in existence. Please cut out this coupon now.

| F A. Barker, Seles Manager,<br>The Willys-Overland Company<br>Toledo, Obio |
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| Please send me the book  |
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Overland Model 28—Pyles \$1,000. 25 h. p.—102-inch wheel base. Made after with single results cost, double results cont and Tor Thomas in Maket, additional said.

Two of the many

All prices include Magneto and ful Lamp agricumen

Members of Association Licensed Automobile Manufacturers, Licensed Under Selden Patent.



Overland Model 41—Price \$1,400. 40 h. p.- 112-inch wheel base-5 passengers. Five lamps and Magnete included

(Concluded from page 72)
gine until the platon is in this position,
and then adjust the tappet until the igniter just breaks contact and the beil niter just breaks contact and the on-stope ringing. To test, crank the en-gine until the piston again makes a compression stroke and the bell begins to ring Continue to crank, proceeding slowly, and observing the position of the piston by means of a wire passing the piston by means of a wire passing through a relief rock, or by marks on the flywheel The bill should stop ring-ing at the instant when the piston reaches its topmost point

#### LACING A PAN DELT

The requisites for joining tog ther the onds of a flat lacer bolt are rawhide lac ing % or % inch wide and a round punch of such size that it will cut a hole in which the lating will make a snug fit For a fan belt of average width three holes may be punched in each end, the outside holes % inch from the end and the center one & or % inch in, the holes in the two ends being in line. The holes in the two chas being in the relative positions of the holes in reshown in the diagram. The laving is passed through the holes in the manner indicated and drawn tight. To secure the end a cut is made on each edge of the lacing, extending inwardly for one-quar ter of the width, the knife being laid fint on the beit. The lacing is cut off 1/2 inch farther up. The end may then be flattened out, and the wings formed by cuts will prevent it from pulling through

The belt will stay in position only when the stitches in contact with the pulley are parallel to the pulley cike If the belt is placed on the pulley so that the slatting stitches are in contact with the pulley face it will lend to ride off

in an emergency heavy who picture cord of the ordinary stranded variety may be used in place of rawhide The only objection to its use is the click that it makes in coming in contact with the

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#### INDEX OF INVENTIONS

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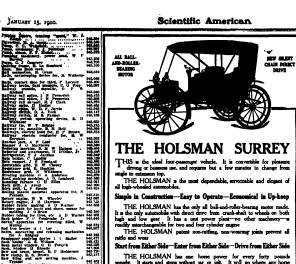
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man is there, that he receives the

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message, and that he will act.

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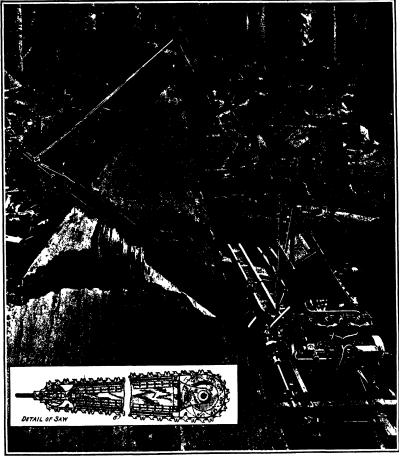


A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol (II No 4. )

NEW YORK, JANUARY 22, 1910

10 CINTS L COPY 68 00 A SEAR



The saw is a chain with tooth-links passing over grooved guide wheels at the ends of a frame

### Scientific American

#### SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, JANUARY 22nd, 1910

The fiditor is always gital to receive for examination illustrated articles on calculation of timely interest. If the photographs are charge the articles of the contributions will peak for a regular game rates attention. A compton article will be past for a regular game rates

#### ADAPTABILITY OF THE STROSCOPIC CAR TO RAILBOAD SERVICE

RENNAN and Scharl, each working indepen ently of the other, have recently proved that
a car containing a pair of gyroscopes can be
run upon a single rail and maintain its starur upon a single rull and maintain in small bility under varjug conditions of evestric loading, side winds, and curving track. Upon needing a prac-lical demonstration of this fact, and schooliting the car, as the writer recently did, to various sever and successfully-endered tends, tit is natural; in the first moment of enthunism to juredict an immediate and widelpread application of the system, or even than eventual? Shadedonment of the present two-rull track same winespreas application of the system, or even that we wentual shandomment of the present two-real track and tradits in favor of the monopail type. Soher second thought, however, must convitice any thoughtful and practical mind that, in spite of the brilliant results of the recent demonstration, the monoral syrescopic car, in the nature of things, can have only a more or less limited amplication under succeeding. more or less limited application under present-day conditions. We wish it to be distinctly understood, conditions. we wise a to be theretainly understood, of course, that any criticisms which follow are in no sense hostile, and are made with a full appreciation of the skill and knowledge, both theoretical and practices are the skill and knowledge, both theoretical and practices are the skill and knowledge, but the skill and knowledge to the skill and knowledge. tical, with which the car now being shown in this city has been developed THE CAR.—Mainly because of its perfect adaptability

to take the curves, whatever the degree of sharpness with a minimum risk of derailment, the promoters of the system claim that trains of this type will be run at speeds from fifty to one hundred per cent greater than those that are possible on two-rail track. Now if the new system is to compete with the old, the trains must provide at least the same capacity and comfort as the present Pullman trains it is stated that, in such cars, the weight of the gyroscopes will represent about 8 to 8 per cent of the weight of the car Structurally, the monorall car must be at least as strong, being supported, like the present type, on two points, namely, the centers of the two trucks. The trucks, however would be lightened by the reduction trucks, however would be lightened by the reduction of the number of wheels per truck from six to say four, and as the sailer would be shortened, it is probe bit that the weight ared in this way would be about equal to the si or 9 per cent represented by the weight of the gyraceopo mechanism Hence, it is not likely that there would be any reduction in the weight of the cars as whole The gyraceopt mechanism, on the the car as a whole The gyroscopic mechanism, on the therhand, would be an extra card and certainly not a very light one in the very nature of things, it must be most carcially constructed and of the very best material. The motion of the car would undoust-culy be easier. The aircrait awaying and shocks inci-dent to the present two-rail system would give place to a very greatin and probably impressystible rocking to a very gentic and probably imperceptible rocking motion, due to the controlling aution of the gyroscopes On the curves the riding of the new type would be greatly superior, the sudden joiting of the care against the outer rail, and the uncomfortable sway against the outer rail, and the uncomfortable sway ing of the passengers in the same direction when the cars are running at high speed would be entirely wanting except possibly on entering and leaving the currese Under the two-track system, the car is placed in a favorable position for entering the curve by the gradual elevation of the outside rail for a dista Fraulais elevation of the duting rain for a facabase of from 150 to 200 feet before the curve is reached, and also by laying out the first portion of the curve as a spiral with gradually decreasing radius. If some means can be found to throw the gyroscopic car slightly toward the inside of the curve before the last ter is reached, it would be advisable to incorporate it.

THE TRACE - Although the claim which is so frequently made that there would be a simplification of the track and it issueshing of his cost is justified by the facts, those detruntinges upoids not be so great at solid at first to happainsteed. One line of raths would be a first by his passed with a languabler, it is true; but the remaining with alterpated it is not be desired. In the spend is to be devised. In the first piace the concentrated weight on each set of wheals would have to be derised. In the first piace the track, outverte, bridges, etc., are directly related to the momentum, and the momentum interesses drive the track, outverte, bridges, etc., are directly related to the momentum, and the momentum tenerous drive that the first piace the track, outverte, bridges, etc., are directly related to the momentum, and the momentum tenerous drive that the fortamic arrivesses upon the rail, the control to the propellier is placed at the story of the velocity, it follows that the offers alignment, low joints, slight deviations are all the story of the velocity in the velocity is part which a start which a start which a start with a start. In it is doubtful he as exceedingly complex and obscure, and considerable the propellier and th In the case of long-span bridges, the concentration

in the case or long-span bridges, the concentration of the weight on the center of the floor would call for increased strength in the floor beams, although in the case of deck bridges where the floor is laid upon the top chards, the trusses or plate girders might be brought somewhat choser together. The cost of maintenance would undoubtedly be con-

The cost of maintenance would uncoupledly be con-siderably reduced, since the labor entailed it is beening two rails to gage and it maintaining the proper super-elevation of the outer rail on curves would be antirply eliminated. On the score of safety, provided a sub-ble form of track were built, the argument is entirely in favor of the groscopic car, and especially so on the

It seems to us that if there is a future for the new system, it will be found in the construction of pioneer railways through undeveloped country, and particu-larly through mountainous and hilly country where s must of necessity be very circuitous. solf-adjusting qualities of the car enable it to run solf-adjusting qualities of the car ceable it to ran around curves which would be altogether impossible for a two-track railroad. The monoreal track could be located around a bill or bild, through which a two-track railroad would have to pass with heavy and ex-pensive excavation Morover, for this class of rail-road a much lighter car would be practicable and ex-tremely high speeds would not be demanded. This decrease in weight and speed would mean a great re-duction to describe the control of the con-traction in the control of the con-traction. duction in first cost and subsequent cost of mainte-nance of the system If the new type should demon-strate in service of this kind its commercial practi bility, it is quite conceivable that it would be ually applied to the more important lines of travel, and eventually, to the main trunk roads.

### IMPORTANT INVESTIGATIONS REGARDING THE PROPERTY OF SHIPL

PROPERTY OF SELFA.

MPORTANT investigations, marking a new era in the study of the propulsion of ships, are about to be undertaken by the Naval Architecture Department of the Massachasetts Institute of Technology, under the direction of Prof. Cecil IR. Peshody; the head of the department, and a corps of sasjetants and resconting the property of the

associates
Already a navigable forty-foot model is in process
of construction, funds for the maintenance of this
work being provided by a friand of the department,
in order that the investigations may be of a prestrict
in order that the consoid with the actual conditions
of ahip propilation, the model is being patterned after
the U.S. S. "Stanting," and will be out on-orderith scale. the U S. S. "Manning," and will be on a cone-fifth scale. The choice of the "Manning" as a type of ship for the experiments is made because Prof Peabody, under whose direction the work is to be done, was directly connected with a remarkable series of speed trials on board the ship, which were reported to the Boolety of Naval Architects and Marine Engiaseers in 1989 After the relations between the actual trials of the ship and those of the narigable model have been extincted and the series of the ship and those of the narigable model have been extincted as the ship and those of the narigable model have been extincted as contains the same of the narigable model have been extincted as contains the same of the narigable model have been extincted.

lished, a certain basis or dearmination will be un-nished, by which it will be possible to determine what may be expected of a full-time ship, before the latter is built. The method which it is proposed using has been tried successfully in Great Britain to some extent, particularly for such types of vessels as the "Maure-spin" and "Lusitania."

takais and "Lustianias" Mesers. Denny Brothers of Dumbarios, Maghasi, have a private model basis in which they have dependent very confidence of allips, and in the case of the papers werend, the "Otakis" which was but by this size of the capacity and power of the near the destination, just such a narrigation model was need to determine the capacity and power of the nearly combinations of proposating anginess and lever-private trifficias. The department has been precision that the operation of the model hash at this Watshipton many year, daying preliminary topic age to be middle there with didn't the a

groups.

Upon the completion of experiments with the shells built and engined to correspond with the probletype, various forms and ionations of propellers will be problets, expendented upon, including twin and triple-screw propellers, especially of the type used at present with marine turbines. The form of the hall will highs be changed so far as may be without robuilding, and the affect of writes forms of slate will be built to extend that or various forms of slate will be built to extend Another important problem to be undertaken will be

the steering and maneuvering, including practical work in rough and stormy sees. As this field has re

work in rough and stormy seas. As this field has re-ceived but Hitte attention in the past, much new and viluable information will be acquired. Thus proposed method of investigation has the con-siderable advantage that a proposed design may be tried on a sparl and inexpessive scale simulating all the conditions of actual service, including the perform-ance of the ship under adverse weather conditions. After satisfactory conditions have been attained by use of the model, the dimensions and conditions can use of the model, the dimensions and conditions can be determined for the rull-sized ship by the theory of mechanical similitude. The fact that the theory leads to the assignment of somewhat higher power to the ship than may be needed gives the designer a

the ship than may be needed gives the designer a mergin that may be taken shrantage of, but which can be controlled by the preliminary experiments with a foll-sign ship for a prototype. The equipment: will be used quring the coming syring and summer by Frof Peabody and his col-leagues for original research. It is confidently as-pected, that results will be obtained which will clear pected that results will be obtained which will clear up certain decours places in the theoretical work and design of the students of the department. The train-ing received by the experimenters in the use of the equipment will thus form a part of the laboratory equipment of the department.

in phytographic practice it is measure; to regard as quasilos of affecting a photographic plain all measures or quasilos of affecting a photographic plain all measures carring in practice, produce hydrogen percentile, with sufficient replicitly to cause a preceptible deposit of silver on a plate exposed to their influence during one week. It is well known that ment criditing agents predone hydrogen dictor from gaseous crygen in the presence of moisture. Almanham, magasulum, and sins, vens at distances of 1/10 and 1/10 fact from the presence of moisture. Almanham magasulum, and time, vens at distances of 1/10 and 1/10 fact from the presence of moisture. Almanham magasulum, and time, vens at distances of 1/10 and 1/10 fact from the control of the presence of the product of the complex points of the product of the product

The percental delete on Martina catala will pro-ably never be settled. Secre the British Astronomical Association various store or ions well-provide distric-comer gave taket views. In: II. A. Sanghay challed some pictures taken at Mount Wilson By Fred Marcourse gaves hasher trious. Wr. S. J. Saves and some pictures taken at Miness Wilson in Prop. Will on which has be too of the equals piceurs. Wr. J. Names, while a troop of the equals piceurs. Wr. J. Names, and J. Names, and a state of the equal of the piceurs of the equal of t

#### Scientific American

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Miscolatica 1966. Bereig Lieve ther Prins Briefri of an epitosit to its storring year.

Final No. 2, 4, 6, 6 H. R. R. R. announced early in 1910 [66] electric motor power will be used as far north 5 North White Plains. The fieley at Wakefield now mids accessary by the change from electricity to steam will be done away with.

The State Commission of Highways of New York has sabint for an appropriation of 890,000 to be used by the Continuous in developing experiments in concomical larges of road construction which would be suitable to us weights and classes of traffic.

a Public Service Commission of the State of New Fork for the First District, will soon open bids for \$7.77 miles of rapid transit lines. The somer work can be begun on these subways the sooner will the

machine manufacturer has invented a new means of power transmission by the use of steel wire. It is claimed that the system is equal in every wire. It is cannot take the symmetric state, and is may be leather belts, steel bands, chains, etc., and is much thesper. The wires are thin, and endless.

ney opie: s, uspayer in a wive are unit, and usually with the Wilfrid Learning, the Premier of the Dominion knada, has launched a bill which calls for the selfting of §15,000,000 for a Canadhan navy of 11 s. The present indications are that it will carry blocked cruisers and 6 destroyers, to be built in of O s. The pre

A special Board of Fire Control has been named by the Secretary of the Navy, to look into the question of the value of the military mast which has been in-ptailed on battleships, and report whether other masts of the same type should be placed on other vessels of

Blace introducing the "Pay Within" cars in runs-chiphia the number of accidents to persons has do-oreased 74 per cent. This is attributed to the arrange-ment of the closed doors and steps, making it impo-sible for passengers to get on or off when the cars

We regret to note the death of Dr. Charles B. Dudicy, consuiting chemist of the Pennsylvania Railroad and president of the American Society for Testing Materinic and of the International Society for Testing Materials. His contribution to the rallway world a most important one

The total length of the new Manhattan bridge con The total length of the new mannattan prings con-necting the boroughs of Manhattan and Brooklyn in 6,855 Sect. The total cost of the bridge, including real estate, is \$15,833,800 The weight of the cables is 6,800 tons. There is provision for four trolley and four elevated tracks, one 35-foot readway, and two 11-foot prom

During the remainder of the winter season vessels of the Cunard Line will steam directly to Flahguard, omitting the call at Queenstown. Since inaugurating new port of call more than 2,000 passengers have use of the facilities which have been provided, and have expressed themselves as being well pleased with the saving of time which is effected by outting out the trip to Liverno

Bade are being asked for the seats and frames of the Steary gate valves to be embedded in the ma-soury of the twin locks at Pedro Mignel, and the upper twin locks and the spillway at Gatus, on the Penzana Chand. Each valve is designed to operate in a well travelling on two relizer train bearings with a guan of tan rote from center to context, fastened to the development and of the well casting. Each valve closes as opening a four valve of the well casting. Each valve closes as opening a four valve for the fort high.

The delay of passenger trains is often caused by a too slow method of admitting the passengers to the trains when the train platform is often crowde. Where tickets have to be examined, and passengers mirra can at once proceed to take

Greek typines.

(Alber K. T. C. D. D. Co. has asked the up-fittle Public Berries chumulantes et reagen the investigation which is a size of the property of th

ELECTRICAL

The quarties of using low-tension metal fitment mps in receiving considerable attention abroad, ransformers are being made for this particular pur-Tre Transportance are being mane for this particular pur-pose, which are Sitted with interrupters, so that they may be used on direct current lines. It has been sug-gested to fit each lamp with a transformer The fila-ment of the lamp could be a closed circuit, forming the secondary of the transformer

A simple method of clarifying the air of a room has recently been suggested. It consists of an elec-tric fan or ventilator, which is operated in a cylinder, and from a reservoir above the fan a liquid is al lowed to drop on the fan blades. This is thrown out against the cylinder in a spray, through which the air drawn by the ventilator must pass. This serves to collect the dust from the air. The inventor of this aystem proposed the use of giverine or scapsuds, but it has been found that practically as good results can be obtained by the use of water

se commed by the use of watching fish was described in a recent issue of the Electrical Review and Western Electrician. A trollay line running between Frank lin and Columbus, Ind., skirts the White River for a In and Columbia, ind, szirts the White River for a considerable distance, and it has been discovered that the trolley wire is frequently tapped to furnish cur-rent for fishing by electricity An end of the wire is placed in the water, and the current stuns such is piscoid in the water, and the current states such fishes as come within its influence, so that they can be taken out with scoop nets. The trolley company and the Indiana Fish and Game Wardon are trying to break up this method of fishing

The following estimate of the value of various electrical industries in the country during 1909 has

| published in the Electric | al World      |
|---------------------------|---------------|
| Electrical apparatus      | \$275,000,000 |
| Blectric railways         | 475,000,000   |
| Central stations          | 250,000,000   |
| Telephony                 | 250 000,000   |
| Telegraphy                | 60,000,000    |
| Isolated plant supply     | 75,000,000    |
| Miscellan-ous             | . 50,000 000  |
|                           |               |

\$1,435,000,000

The value of aluminium for the field coils of railotors has been tested in Germany It is found way motors has been tested in Germany It is found that the sluminum takes up less space than the cop-per, although a larger mass of metal is required. Se-cause no covering is required. The oxide film on the aluminium provides sufficient insulation and there is no danger of destroying or weakening this insulation by charring as in the case of the cotton covering when the motor is overheated so that there is less dan ger of short circuits. The principal advantage, how-ever, is in the reduced weight, as the sluminium colls weigh but half as much as the copper colls.

A writer in La Revue Electrique describes the ex-periments of Miroslaw Kerubaum to determine the ef-fect of ultraviolet light on liquids. He subjected about half an onnee of water to the rays of a quarts merhalf an other of water to the rays of a questi mor-cery vapor ham, and after about ten bours gas ap-ceptive and the second of the second of the hours also cable millimeters (0.016 cable tach) of gas was produced. The gas proved to be hydrogen, while the water showed that it was charged with orygen This experiment explaints the presence of oxygenated water in snow and rain. It is proposed to use this method for setroiling liquids, as oxygenated water is an excellent germicide.

How that serial navigation is coming to be or sidered seriously new problems are arising, such as the question of navigation on starless nights or over fog bound land, when the aeronaut will be unable to fog bound land, when the aeronant will be unable to find his bearings. It has been proposed by a German invasior that a network of wireless stations be-established over the land, each automatically seeding out a predetermined signal at requise intervals, which would be received by the air certs, and enable the aeronant to determine his course. The attractive would not be required to carry transmitting apparatus, as a small receiving apparatus would suffice to enable these to want themselves or the proposed represent, and there are well themselves or the device could entity be large down to a few possible.

hept down to a few pounds.

A sew method of destronhing the map of overhand
wires has been suggested by a writer in the Electrotechnicable Echecherit. The pendutum principle is
sumplyord. The sungring wire in set to swinging, and
the number of oscillations per minute is noted to
complete motion back and forth being considered, secording to European synatics, as made up of two conlations). Letting N stand for the number of oscillations). Letting N stand for the number of oscillations). haltons). Letting N stand for the number of confiction, the sag in centimeters is determined by divising 445,000 by N\*. To find the sag in inches, dividing 445,000 by N\*. To find the sag in inches, dividing 445,000 by N\*. To find the sag in inches, dividing the period of the confinition between poles and any weight or say delatance between poles and any weight on a sample of the confinition is determined only by the vertical similar harmonic in the sample of anything of the sample of the SCIENCE

Prof. H. H. Burnard of Yerkes Observatory has succeeded in obtaining a photograph of Halley's come which shows a faint slender straight tail 86 far as is known, this is the first photograph to show the tail f the present returning of

A new estimate of the earth's age has recently been given by Prof William Morris Davis of Harvard For the usually accepted one hundred million years he ates sixty million, based on an examination the cliffs in Arisons and Utah where the time tak eposit the strata can be easily con

One objection to glass roofs is that if they are not very steeply inclined, the water of condensation collects on their under surface, and instead of running down along the separating ribs of the panes or plates, and along the beparating rise of the panes or plates, and being led off, drips upon persons or objects below, which is inconvenient and may be very expensive Even where the panes or strips are short, the path to the trough is too long The increase in length and width of the plates now used makes this difficulty of width of the plates now used makes this difficulty of more and more importance each year. One way of getting around it is, however, similar to that employed in forests and parks to prevent washing away of the hillside paths, namely, making inclined grooves to ward the sides, only in this case the grooves are of horeschoe shape, and form a series of parallel corrupa-tions of the control of the control of the control of the internal control of the control of the control of the control in pales. Here then follow these the plate, they then follow these without much diffi-culty down the slant to the trough below. This system may be employed either with glass sheets in which wire is embedded or with plain plates.

We notice in a recent number of the Medical Record a letter from Dr Robert I Watkins, New York city, in which he claims the credit of having applied the movwhich as claims the credit of naving applied the moving pleture to the inferencepe. He states that as far back as 1897 he domonstrated the machine to a private audience, among whom was the Reliter of the Beign-Tifle Assignator. The machine, known as the "micro-motoscope," was described in our issue of July 31st, 1897 Later, microscopic moving pictures were exhi-ited at the Grand Central Palace during the Traine Nurses' and Pure Food Exhibition, the pictures thrown on the screen exhibiting the circulation of the blood in the web of a frog's foot, rotifers in stagmant water, an amedoid leucocyte, typhoid fever germs, and many others. Since that time Dr Watkins has greatly improved his rough apparatus, and gave a demonstration on June 17th last at Chicago before an audience of five hundred physicians of the National Eelectic Assomay venture to point out that Dr mandon employs not the ordinary mircroscope, but the

The third paper dealing with the results of the Smithsonian African expedition under Col Theodore Roosevelt has just been issued by the Smithsonian Institution It describes a new species of Octoores to which the specific name of pirguiss is given to which the specific name of virgulus is given. This new animal is a small carnivorous mamnial closely resembling a for. It is generally buff in color, and it has been found by Mr. Gerrit Miller of the museum. staff to differ slightly from Octocyon megalotis, which occurs farther south, especially in color and in the characteristics of its teeth and skull. The octocyon is peculiar to Africa, and is not represented in the United States, but resembles in color the swift or kit fox of the western plains. The skull of this new form closely resembles that of the gray fox of our native fauna. This announcement is of special interest for n that comparatively few new forms were expected from this region in Africa as the territory up to this time explored by the Smithsonian African expedition has been pretty thoroughly examined by British naturalists.

The water bottle for gotting water for analysis from selected depths in the coxen is a cylinder of brass. German silver, or other metal which resides the corrosion of see water, generally about two inches in diameter and twister or fourteen inches long, with upwardopening valves at the top and bottom, connected occupant of the control size. It is not the side of the control size in Long are cast on the side together on a central stem. Lugs are cast on the side of the cyllinder for conveniently securing it at any point along the length of the line by which it is to be revened into the security of the time by which it is to be compared to the contract of the security of the sage of the water through the cylinder during its de-sent, but, when the motion is reversed, the waters seat themselves and are locked by the descent of a small propeller in the framework above the upper small propeller in the framework above the upper valve, which rides tilly on a sleved during the lowering of the bottle, but descends along a serve thread to press the valves tope their easts when the line com-mences to be basied up. A specimen of the vater at the depth to which the water bottle has descended in this brought to the surface confined within the bottle, and a series of specimens from different depths may be obtained at one head by securing a series of water bottles at the required intervals along the sometime

## THE SCHERL GYROSCOPIC MONORALE

THE PRINCIPLE OF ITS OPERATION

Within the past few months Mr Brennan has ex bibited at London a car whi h runs upon a single rall and is prevented from fail ng over to either side by the resistan c of two gyros of es carr ed on the car At about the same lime Mr S herl a German capital lat exhibited in Berlin a similar ar B tl cars were

The gyroscopic car inclines automatically to the inside of a curve

ried their loads successfully and in on h ase the gyroscopes maintained the car in a state of equilibrium—and they did this even when all the load was placed to one side of the car or when the car was running around a urve

Apparently the inventors worked quite independently apparently the inventors worse quite independently of each other and it is a remarkable fact that in the essential elements for the control of the gyroscopic, mechanism they should have produced machines so broadly identical. The Grman car which is now be ing exhibited in this city represents the joint labors of Mr Ia i Froeli h the inventor who worked out

tions per minute. We are all familiar with the gyro-scope of the toy shops or the lacture room—the first mountard rotatably in one the second in two encom passing rings with the axes of the rings at right augles to each other and the figwheel axis in each case capable of universal angular motion. In the ac-

case capable of universal saguiar motion in the so-companying engraring we show a gymesope mounted as in the Scheri car. The gywheel is car ried on a vertical saids which is mounted in a gimbal ring. This ring swings on a bord total posts mounted on a beard total posts mounted on a beard will consider to represent the dack

which, for the present purpose we will consider to represent the dock of the car. If we change the plane for rotation of the flywebs present good on the flywebs present good on the state of the present good on the state of the good of plane at right angles to the plane in which we have depressed the

This tilting of the axis is known as its precession If now we en deavor to increase the precession by pressing down upon the already tilted axis the latter will resist

v ry strongly and there will be developed at the same time a large additional resistance to our depression of the side B of the board. It is in this advancement of the pre-ssion as Brennan alls it though the pre-cession be assed of the vigorous resistance of the fly wheel axis is not actually advanced) that the secret of the successful gyroscopic car lies as will be evident from the following des ription of the onstruction and operation of the Scheri car

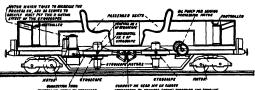
Referring to the engraving showing a longitudinal section it will be seen that the car which is 4 feet wide by 18 feet long is carried on two 2 wheeled

completely incises both motors and flywicels will the gyroscopes run in a perfect vacuum—this to avell the skin friction of the air which would retard the speed The caning are mounted on transverse axes just haled in the frame of the car and they are theighten hated in the frame of the ear and they are thoughten free to rook in a fore-end-art direction. The binguistic between the motor and the casing is so small tight the hast of the motors can i many the insciniting spik had radiate away freely and "heating up is therethy avoided. The speed of rotation of the 128-possis fly wheels as we have stated above, is 2 000 per phenois.



With three men on one side, car tilts to opposite side, restoring equilibrium

The rocking of the gyroscopes is in opposite directions—if the car is titled to one side they rock toward each other and sole overse and to insure simultaneous and equal movement they are connected together by best crank levers and two toothed quadrants as sh crank levers and two toothed quadrants as snown in the drawing In front of the gyraceopes is an electri-ally driven oil pump for generating hydraulic pres-sure to drive a precession motor which is carried at the rear of the gyraceopes. The precession motor one sists of a cylinder and piston controlled by suitable valves. These valves are themselves operated by the rocking movements of the gyroscopes and the move-



Longitudinal secti a through Neberl gyrostatic car

the theory and data for the design Mr Rmill Palake who designed and constructed the car and Mr Scherl the owner of the patents
Tar Otress ora—The simple groscope consists of a stylend to mounted upon a system of bearings it at its axis may be titted in any direction. The pe ultar and most interesting behavior of the groscope in the tot it fact that who as flywheel so mounted is rotat town to the contract of the to tre met that win h a nywhest so mounted is routing in a given plane it resists any effort to change its lane of rotation by til ing the axis on which it is turning. The tendency of the flywheel to maintain its plane of rota ion and is resistance to any force tend

ing to til it out of that plane is proportional to its momentum and since momen tum in reases di rectly as the weight and as the square of the tomary to use as small a weight d as high a ve and as possible dence the fly is heels used in the Scherl car weigh only 125 pounds each but they rotate at the swiveling trucks placed centrally below the longitudinal axis of the car—It is driven by two % horse power motors one on each truck—At each and is a controller and a box containing various operating switches In the center are two seats accommodating four passen

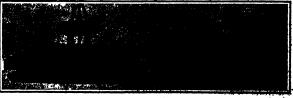
Mounted in the car frame underseath the s Mounted in the car frame underneath the seats are two gyroscopes one of which rotates lockwise the other anti-clockwise. The flywheels rotate normally in a horizontal plane on vertical axes. On the lower sad of each axis is mounted an electric motor. The axes are journated in atrong steel airtight casings which

471444.00 TRACE Michaell Trees

Old an I new method of rounding curv

ments of the piston are caused through suitable mechanical connections to exert a tilting pull or punk, as the case may be against the graveopre as a the case may be against the graveopre to the mechanism of the control of the graveopre This natural presention extends to the control of the graveopre This natural presention extends to the presention motor which is turn title or attempts to tilt the graveopre still further on its traverse axis and so increase the grownists. The graveopre here extends to the control of the contr

so that the



enting plotters of one) to tilled transvendy the grounded Sprived will till have or all according to the disculting all input index will be developed a strong resistance to the movement of the table. This pice stall off personness is called the measure.

View showing gystemph meridants. THE SHEETS STREETS THEOLOGY SALE

which we will be the second to be seen to be

memoral equilibrium is restored.
Another of our photographic views shows the striklag subscenses of a cer running around a curve upon
a single rail and inclining inwardly to the proper de gree to sanistatin its equilibrium. To practical railread
meet this is oversized the most attractive feature of the investions for it would mean the elimination of all the difficult outerallotory and acquarter problems. cted with the super-elevation of the outside rail se present two-rail tracks. It is a fact that the on the pr car is so intelligent (we cannot help using the term) car is so intentions (we cannot not pusing ine term) that whether the curve be easy or sharp and whether the car rounds it at ten or seventy five miles an hour it will lean inwardly with mathematical certainty to the exact amount required by its speed and the sharp

as of the curve
In the standard system of track the compos mtrifugal force tending to hurl the car over to the outside of the curve or cause it to jump the track is souslined by elevating the outside rail until the re nt of gravity and centrifugal force falls normally a track This condition (an only hold true on any to the track to the track This condition can only hold true on any given curre for a certain speed Below that speed a train will grind on the lower rail above it will crowd against the outer rail Not so with the gyroscopic car As soon as it enters a curve the pull of centrifu

car As soon as it enters a curre the pull of restrictly again frome is resisted and the gyrecropes draw the car over to the inside of the rail until the resultant or all the forces acting upon it passes intrough the rail The gyreccopic car as above described is one of the most brilliant investions of this or any ages But is it practical and will it pay? A discussion of this quest that will be found in our wildrail columns.

#### THE DEATH OF LEGS DELAGRANGE

After making a wonderful new record of 14s miles in 2 hours and 31 minutes on December 30th with a Bleriot monoplane Leon Delagrange who with Heary Farman was the first aviator to make flights with the crude Voisin biplane in France in the spring of 1907 crusts Yosin biplane in France in the spring of 150° met his death by a fall with the same monoplane on January 4th while dying at Bordesau. Our photograph shows M Bleriot with Delagrange standing at his left and Le Blane another daring pilot of the Bleriot machine at his right. Behind the three mentands the machine which is like that Bleriot used in creasing the Channel and which Delagrange used on the day of the accident A rather strong with we believe and according to colde resports when the machine headed into the wind the right wing souther headed the companies self to the ground

This is the first accident which his occurred owing to the collapse of an aeroplane when in the air We understand, however that some time ago a similar accident happened to Latham, but without disastross results. One wing of his Antoinette mononiana broke results. One wing of his Antoinette monopiane preze off and stood almost at right angles to the other wing yet by leaning to one side and warping the remain ing wing, Latham was able to guide his machine down in circles and bring it safely to the ground After repairing the wing he attached it in such a



BLERIOT AND HIS TWO PILOTS IN FRONT OF HIS NO 11 TYPE MONOPLANE

way that when he was up in the air he could oull a way tast waten no was up in to sair ne could puil a cord and cause the wing to break off as before He did this and tame down a second time with the wing broken simply to demonstrate that a broken wing did not necessarily mean disaster in the Antoinctte ma chine the wings are secured separately to a mast so that the breaking of one does not affect the other. In the Bleriot monoplane the wings are connected to-gether over a tripod the result being that if one breaks the other collapses and the machine is sure to be dashed to the ground

The death of Delagrange will put a damper upon the arder of some enthusiasts for a time but it was due to one of those unfortunate accidents which are siways liable to occur in the development of a new His name will go down to history as or martyra of serial navigation. He is the fourth aviator to be killed within the past four months the others be ing Lefebvre (who plunged to earth in his Wright machine) Capt Ferber (who struck the ground when making a turn in his Voisin) and the Spanish tailor Fernandes (whose small hiplane resombling the Cur tiss broke while he was making one of his first flights on December 6th last) All four fatal accidents

A NEW REGLISH TRIPLANS
Illustrations shows the new triplane One of our illustrations shows the new triplane of Mr A V Roe Mr Roe is one of the most persistent English experimentors. He has been working a long time and has finally developed a successful machine time and has many developed a successful machine little this discussion is really a Langley type machine in triplicate since it has three superposed surfaces forming a tail and attached like the forward planes to a tri angular body. The motor is mounted in the body at the front end of the machine and drives a three

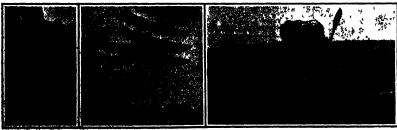
bladed propeller mounted upon its createstaft. The aviator sits in the body about half way between the main planes and the following planes or tail. The machine is mounted upon two wheels at the frost and a skid at the rear It is 23 feet long and the planes a shid at the rest. It is 33 feet long and the planes have a spread of 10 feet and 130 quarter fact of supporting surface of They are set at an angle of five degrees. The forward planes are 30 feet by 3 feet 7 inches while the rear planes are 10 feet by 3 feet 7 inches in size The total weight of the machine originally with a 10 horse-power Jap motor was but 200 pounds. A larger motor of 30 horse-power has been fitted The weight has been considerably in creased. The body is made of sold wood 11 in covered with cotton off paper becked with mealin The created the set of the set

Mr Roe has done most of his exper Wembley Park and recently the grounds have been enlarged there so as to give him more room. He has made a considerable number of short flights in a straight line and his machine is remarkable low power light weight and small spread

#### AVIATORS CONTURNS AND A MAGNING FOR TRACKING REGISTERS.

Two of the photographs reproduced on this page give a very good idea of the costumes worn by French aviators and of the dress soon to be adopted in France by the lady operators or aviatres The costum used by the men consist of overalls and immor and a light fitting skull (a) ompletely covering the head The contume being used by the lady operators con sists of a loose blouse and long bloomers extending to The contume using used by the lady operators con-sists of a loose blouse and long bloomers extending to the tops of the shoes. A skull cap similar to that used by the men is also worn. At the present time but two ladies have made flights by themselves in zero-planes in France. These are the Barroness de la Roche planes in France These are the Raroness de la Roche who operates a Volsin biplane and who recently met with an actidant by running into a tree and Mine Marvingst who is the first woman in the world to Mine flows a monoplane She has made saveral second lights with a Flaurich machine A number of solid lights a wine Flaurich machine A number of called and learning however and several aviation actions are learning however and several aviation action have been formed for women One of the machine tracestic organized of these was formed at Los An evidence, as a several aviation of these was formed at Los An evidence, as a several aviation of these was formed at Los An evidence, as a several aviation of these was formed at Los An evidence, as a several aviation of the sev geles (al

Another interesting licture at the bottom of this lage shows a novel training machine for accustoming aviators to a monoplane of the Santos Dumont type This markine consists of a substablial triangular body mounted upon three wheels and terminating in a tail mounted upon three wasers and terminating in a tail having movable vertical and horizontal surfaces by which the machine is steered to right and left whan running along on the ground or by which the tail is made to rise a short distance in the air. The two bottom members of the triangular frame are extended forward and meet above a small wheel five or six feet forward and meet above a small wheel ave of his res-ablend of the main wheels so that if the mach line the forward when the tail rises the front which keeps it from the ling too far. A four-cylinder water-cooled motor of 40 horse-power is mounted upon a U shaped frame and varies "propeller in front on its trank shaft. The would be aviator sits in a small seat below the motor with the control levers conveniently at hand. The machine is fitted with large wire whoels fitted with large diameter | noumat o ti utest with sarge manner; pounds of the Wil has marbine a beginner can irravi at very fast speed over the ground and accustom bimself to the steering side ways and up and down of a monoplane. The machine should serve a useful purpose in training aviators who intend to fly this type of acroplane



Marin triplano in Micht.

Machine for familiarizing beginners with an aeroplane.

HE PRINCIPLE AND A PRESCRI MANIFER FOR TRACEISS HEW AVIATION. A SHIP A . . 18

#### Scientific Americani

A NOWIN-DELYMIN SAW,

The continuously running flexible saw is by no means a novelty to our readers. Its leading principles are embodied in the hand saws now in cotanous, although effective for sawing lumber band saws learned and control of the sawing lumber band saws. are incapable of cross-cut sawing on large trees is the forest because the band necessarily runs in two planes. For the purpose of overcoming this objection Mr R L Muir has perfected a new style of endless cross-cut saw which is flexible in a single plane of crossect saw which is fessible in a single plane of motion and which is carried in a frame which with the idle side of the saw follows the saw-cut through the long the frame being sufficiently stiff and rigid to keep the saw in perfect line The frame in question 1 is made of thin steel with groome degree Projecting brackets 2 and 6 are boiled to the ords in the brackets guide wheels 2 and 4

with grooved peripheries are journaled. The bracket 5 has a handle by which the operator controls the 5 has a handle by which the operator controls the new An endiese chain composed of saw likes 6 is mounted on the guide wheels and runs on the straight degas of the frame. The guide wheels on the frame serve to keep the chain straight during operation. This frame and the toothed chain constitute an end less saw which runs continuously and with makes a single saw cut in the plane of its motion. The saw moreover is adapted to all kinds and styles of saw moreover is some place to an amount and so, we one when for which (there circular saws band saws or mechan ically driven re hyrocating saws can be used and for which hand saws are ordinarily employed the two handled cross cut saw being a familiar example

The chain saw is driven by a gasoline or electric The chain saw is driven by a gasonine or securior motor the inner guide wheel being gaared up with the motor shaft as indicated in our front page illustration. The motor is carried on a skid which skid is moved along on ways whenever a new cut is to be

Mr Muir has carried on extensive trials w Mr Hull' has carried on oxensive trans with the saw in the vast redwood belts of Mendocino and Hum boldt Counties in California with remarkable success The most important advantage of his construction is that of the speed. One of his large saws it is as serted will cut through a tree having a diameter of t in less than ten minutes B the old and slow hand process this same work wo ime an hour and a half with two mon wielding aw One of the machine saws will accomplish as much as from 25 to 30 expert sawyers a wonderful saving in time and expense when it is considered that only two or three men are needed to operate a ma only two or three men are needed to operate a ma-chine. The sava can be run horizontally vertically or on an incitine. Trees can be saved within a few inches of the ground—a great arring thus being of fected in stump weats. In feiling trees of immonate also by the slove chopping methods hundreds of feet of valuable timber are lost by chippage because it is often necessary to cut up as high as eight feet we the level of the stump. The mechanical saw eribed avoids much of this waste

#### AN ELECTRIC PERFORATING PEN

Though various efforts have been made from time time to evolve an electrical system of securing an

Thougas recovered to time to evolve an electrical system or as indefilible writing r cord which is complete proof against both forgery and fraud such devices have proved commercially in practicable A Parsee inventor however Dr Dinash P Ghadiall has covieved a comparating which is very efficient. It Dr Dinahah P Ghadiali has evolved a simple apparatus which is very efficient. It is called the antiforge pen which as its name implies is to render forgery impos-sible. The writing is made up of a series stole the writing is made up of a saries of perforations burned in the paper The apparatus comprises a small box with a sloping lid measuring about 20 inches long by some 16 inches wide. The whole of the by some is increased and The whole of the electrical equipment is carried within the box or deak the lid of which is glassed and carries at is upper end a sheet of aluminium The pen itself is of the ordinary stylographic type

requisite current is drawn from a small f ampere storage battery as shown at A in one of the illustrations. The bat-tery is connected up in the usual manner to an induction coil B to which is fitted a small high-speed trembler capable of ad a small high-spe justment by a thumb-screw on the outside of the deak Between the secondary term

the coil a small cylindrical condenser C is placed in r to increase the intensity and fatness of the

In an electric system of writing care must be taken to prevent the inside of such letters as o d r and so forth from dropping out which would result if the outline were continuous. This possibility is obviated by means of the tremlier cell which makes the current rapidly intermittent. At the same time however such rapidly succeeding waves of electrical energy rising up to 10 000 volts instantly followed by a drop impose a severe strain upon the induction coll,

and will in time seriously affect it. To gence appears such a result the investor has interestent a novel tie-rice which may be beet described as a safety valyle to the cold. This is a highly enhanted recovers using, D which is also placed between the secondary termi-nais and which is in parallel with the pen if This saleric busines or vensum tube acts as bulbed food to the passage of the electric current through the pen is taken up thereby cassing it to glow brilliantly all the same time it also acts as a galvanometer as before writing the operator simily pressee the pen special gainst the deak, and the resultant glow in the vacuum



Specimen of writing with the electric pen-

tube indicates that the apparatus is working efficiently.

The pen is about the same length as the ordinary fountain per and its barrel contains a mercury break. The connection with the coil is effected by a short The connection with the coil is effected by a short-legath of facilities wire carried on a spring harrel. By means of the mercury break contained in the harrel the primary circuit is never closed until the pen is held in the normal writing position. From them, the current cannot flow to the point of the pen because the cone shaped extremity carrying the metallic writ-ing point is aspeared from the barrel connection of a spring plate in expansive from the barrel connection point is present quot the paper whepeth the metallic extremity is pushed inward against the metallic extremity is pushed inward against the accuract and now to the new notes.

extromity is pushed inward against the mercury that the current can flow to the pen point. To use the pen the sheet of paper is laid upon the aluminium pad which on its under side is connected to the secondary terminal of the induction coil by to the secondary ferminal of the induction cell by means of a flat spring. When the point is pressed hard against the paper and the electrical circuit is compleid the resultant spark burns its way directly through the paper leaving behind a distinct perfora-tion. The sire of the hole thus produced can be value as desired from a large coarse perforation to a small almost invisible pin prick by the adjustment of a rheestat, the knob of which projects from the left hand effect the second products of the projects from the left hand side of the desk

metallic point only the perform of the writing is produced but it may be desired to secure a legible distinct surface inscription as well In this case the metallic point is replaced by a small imms gramme. We gramme to district the district to the rests this region the page which the law of the protestancy, call they are presented as consequently account of the protestancy o upon The current will burn its way through the whole mass of spaces to that the signature is writing shull assessed on each and in period diplication. Occasequantly it is absolutely impossible involution to withdraw one about and insert another with an aignature, for it is only to another of counting the small bar of dots or perforation marks in the aignature on each sheet, and that which differe from the rest is obviously suprison at many as eight absels can be perforated by the pra as a time.

#### The Payrell of the Havy.

To provide for the welfare and comfact of the offi-oers and emisted men of the navy during the faral year of 1911 it is going to cost Uncle Sam just \$5 767, 417 Of this amount over \$5 000 000 will be spent to buy food for the 46 480 emisted men. The Navy Deonly most for the 2 see cannot meet. The Newly Di-partment figures that it could the government \$1.00 a year to feed each man, or just \$0 a month. The pay-year to feed each man, or just \$0 a month. The pay-year foil of the sellated men in the nany during \$151 will aggregate nearly \$12.000,000. This sum will take care of 41.725 in the general service \$44 men in the lausier force and 1.125 prisoners under sentence by court martial

About one-fourth of the men serving in the navy to day have re-culisted Of the 43 333 allowed by law 11 681 men are estimated as under re-enlist 11 871 men are estimated as under re-milistenet and entitled to participate in the allowances for reen listment and continuous service. These figures do not take into consideration the 1500 or more apprections. Based on the men in the service in June last the saverage pay of the sullisted men was 185 75 a meents. The perquisitors allowed officers in the nary will ap-gregate nearly three-quarters of a million dollars in

gregate nearly three-quarters of a million dollars in 1911 Of this amount \$144.469 will be spen: in provid-ing heat and light. The heaviest cost in the allow axone granated the nearl officers in addition to their pay is in the matter of quarters for those who can not be accommodated in buildings or houses main-tained by the government. The communition of quar-ters will aggress the 1815 100 while the communitation of the care will aggress the 1815 100 while the communitation of ns figured at 30 cents a day will reach a total

#### An Mostric Plant Operated by an Air Tu

Near Hamburg Germany is a small electric estab-lishment concerning which the following interesting details have been published The installation com-prises 400 incandescent lamps and five electric motors, which drive a investing machine a hay outbur a cream separator and two pumps. The total

cream separator and two pumps. The total capacity is 40 kilowatts. The Heroules turbine has a wheel 40 feet in diameter meunted on top of a steet inver about 100 feet high The apparatus begins to work as soon as the wind attains a valocity or 12 feet per scond. In this region a wind of this two can be counted on the 10 better. of this force can be counted on for 10 hours day on the average With a wind of 26











The inventor using the perfecuting pits,

AN REMOTRIC PREPORATING PRE

length of graphits—that taken from an ordinary lead posed acts accellently. Thus in writing one series a visitis surface record and when held up to the light a performant encord may also be seen in order to de-viate the necessity of helding the paper to the light to see if the perforating in being ediscistiv global, there is a small metallic filament lamp and reflected fitted match the deals and by pushing a betton on the left hand side the written can assessman the results by committing the writing in the light transmitted through the glass deak 156.

By this method of writing it is impossible to preduce two signatures emethy allies, even 15 writion by the length of graphits-that taken from an ordinary lead

#### · Coursepondence.

#### A PARTITION OF THE PARTY

Stor of the Statestree J

We the 1886ce of the Senayment Assuments
It your excesspondent to the Sense of November 17th
with stady the Sollowing Signers, he will plainly see
that it is frepossible to got 85 auto of 2 out of 115 so
that no two numbers will be in the same set more

| Charge mason. |         |         |         |         |         |
|---------------|---------|---------|---------|---------|---------|
| 1 1 1 1       | 1 611   | 1 713   | 1 8 18  | 1 9 12  | 1 10 16 |
| 4 4 4         | 8 718   | 2 814   | 8 9 11  | 2 10 13 | 2 6 15  |
| 7 8 9         | 8 8 18  | 8 9 15  | 8 10 12 | 8 6 14  | 3 711   |
| 10 11 13      | 4 9 14  | 4 10 11 | 4 6 18  | 4 7 15  | 4 8 13  |
| 18 14 15      | 5 10 15 | 5 6 13  | 5 7 14  | 6 8 11  | 5 9 18  |
| Brooklyn      |         |         |         | JOHN V  |         |

#### LOCALINING GASOLINE EXPLORED

Receiving a Machinery essential to the Machinery essential to the Butter of the Security Astronomy. The recent supplies of a gaseline team on an automobile and also one in this vicinity of an autobox. The recent supplies of a gaseline team on an automobile and also one in this vicinity of an autobox. The supplies of a powder fundory and one of the means used to minimize danger was in the construction of magnetism. In order to leading the end of explosion of the control of the contr

## CONTINUOUS REMOTION OF A MILE To the Editor of the Strevinic American We all know that the middle and western portions

We all know that the middle and westers portions of this country are laid out in mile-square serious which can be continuously blacked to form homeand of 100 acres and then analler loss whose sizes and location can be briefly and accurately described in the state whole number that we reach by middriston in this maniner in fort is 165 and this would form the sides of a square whose area would be 100 square role.

Continuing the bisection of this 185 feet through inches and fractions thereof we presently reach the length of 80 3275 inches which approximates to the U S military step by 0 0035 inch an amount inappreregan or a serie mones where approximates to the US mittary step by 0.005 inch an amount inappreciable in actual measurement by panic in temperature in the property of the pr

Me de trainsplaidy dies approximation to our stand and assesses of quantity in Semal in further twice in the light in the Semal in the Seman in the

#### Scientific American

"quarter" hear instead of so many dimes or so many minutes, "haif" ten or "haif pothed instead of so many posseds or cuscess. Observe too that it (contin none bisection) is the method we use in deriving all

JOHN M BURNOP

#### SIGNTING A RIPLE. To the Editor of the SCHENTIFE AMER

To the Billior of the SCHOWLYD AREBORA.

Brevy marksman is familiar with the effect of raising or lowering the rear sight on his rife. Perhaps on the commonly understood it is the effect of raising or lowering both front and rear sights simultaneously on point-blanks range the target front and rear correctly pointed the trajectory of the builet is correctly pointed The trajectory of the builet is accurate intersecting this straight lime in two points one of which is the center of the target. It therefore on range there is another range for which it is equally correct and it is the purpose of this article to show rowth a ranging the elevation of both front and rear sights

The most accurate shooting is done with 0 12-caliber The most accurate absorting is done with 0 32-caliber rifes at ranges of from 15 to 50 yards and when once the sights are correctly set for one range no marks man likes to change them 1t may therefore be of interest to how how they may be set for correct work at two ranges which may be a considerable distance.

apar.

The path of a projectile is occuo is a parabola and since air resistance may be neglected for very short ranges and low velocities the parabola equation will be correct enough for our purposes. The equation is unually stated thus

w is the distance from the line of sights to the center y is the currence from the line of signits to the center of the gun barrel r the range g the acceleration of gravitation and s the angle between the line of sights and the center line of the gun barrel. The re-lation of those quantities is all shown in exaggerated dotail in the diagram

Since the angle a will be quite small for short ranges we may replace too a with unity which is ; ractically its equivalent thus simplifying the equation. This

Taking data from a Winchestor 0.22 rifle equipped with globe sights and sighted for 70 feet we have  $y \approx 0.05$  inch  $\approx 0.0468$  feet  $v \approx 1.000$  fort per se

Reducing to the form  $s^a + -s + -$ -=0 in whi h the 4

product of the roots equals the third term we have

$$a^{\mu} = \left(\frac{1(00^{4} \tan a)}{16 \cdot 1} x + \frac{100(^{4} + 10)}{16 \cdot 1} + \frac{100(^{4} + 10)}{16 \cdot 10} + \frac{100(^{4} + 10)}{16$$

Calling the roots s and z, z z,=-- 0 04**6**8 161 1 000\*

1 000

Thus when one range is 75 feet the other is 39 feet opicion is toe close to be of any use. We are also that the 75-frot range is on the falling side of the curve so that a Mittle greater distance will land the belief

low the mark To bring e, on the farther side of e, it is evidently necessary that y must be increased or in other words both the front and rear sights of the rifle must be al-

We will now find the value of y so that the gun will shoot correctly at both 7" and 150 feet As before

$$a^{\alpha} - \left(\frac{1000^{\alpha}}{161} \tan \alpha\right) \alpha + \frac{1000^{\alpha}}{161} y = 0$$
 (8)
Taking the product of the roots equal to the third

Thus by setting the front sight 3.17 inches above the caster of the hors and elevating the rear sight till the gas aboots correctly at 7 feet it will be from Apic elevating the raw sight till the gas aboots correctly at 7 feet it will be from Apic elevate at 150 feet. Moreover it may be shown that the property of the

sights may also be determined from the equation but it is much easier to get this angle right by means of trial phote, as it is very small and difficult to meas-ure Its determination is as follows in equation (3) the sum of the roots equals the coefficient of e with its

Of course all the above results are based on the assumption that the valority is 1 000 feet per second which is about correct for a 0 J short cartridge Be-

low is given a table in which the values of y aro worked out for other velocities and ranges. Air resistance which causes the projectile to depart from a parabolic path will have the general effect of causing the tabular values of y to be too low but this effect is not very noticeable for the short ranges and low velocities which are common in 0 22 calibor marks

vanits are not intended to as ply to high power rifies and long ranges although the departure of the projectile from a parabolic path does not alter the fact that any rifie may be correctly sighted for any two ranges within its limit



The Light of the Pirofy

After r ferring to the original work of Profs Lang ey and Berry and describing accurately their methods of investigation Dr H B Ives and W W (objects draw from their wn investigations the following very interesting enclusi n as to the relative efficiencies of the light of the firefly and that of incandescent electrk jamps

fillen y of the light of the carbon filament lamp is 0.43 per cont in other words of all the energy on a med only 0.43 per c at is converted int light The tungsten lamp has an eff in sy of 1.3 per cont and the mercury ar 38 per cent. The efficiency of the light of the fireft is 16 per ont. Making the comparison in another form the arbon filament lamp comparison in another form the aroon number tamp has an efficiency of 83 and the per mean themspherical candid the tingsten lant 10 per candle and the metallic are of walt per candle. In comparison with these the fields has an efficiency of 002 waits per candle.

The Current Repplement

The Current Repplement

The Current Repplement

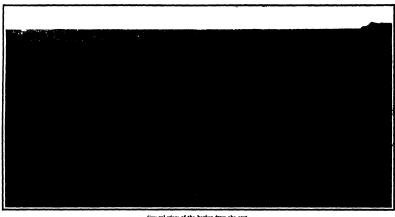
The Current Represent No. 177 opens with an interacting active by the Emplish correspondent of the Senature American on the Madrae Harbor Works which include, a nouril horselves a rare 1.00 feet long to proter a new entirance E. A. Alicut writes on proterior and the Company of t there has been another and very different development going on vis the growth of a branch of the science of going on via the growth dis a branch of the science of optics which deals with the measurements of luminous values and which has been embodied in what is now called illuminating engineering. Dr A D Rockwell writes on the incandescent and are light in medicin writes on the incandescent and are light in medicin Cartagena for Indias as it is as frrmed by the an cient governments and nor woken [In Colombia as The Herolo (17) has more I fit in tark and med-dramatic in her history than any other town on the western continent. The story of this community is told by lease A Manning. The year 1909 marked its three hundredth anniversary of the invention of its names nunaredth anniversary or the invention of the telescope the occasion is fittingly described by Prof J L B Dreyer in an excellent article on the history of the invention of the telescope Mr ( harles Rich ards Dodge contributes as a r 1 1 on forest destruction by insects a raws forest fires

The Battle River Vindu t of the Grand Trunk Pacific Railway 677 ½ miles west of Winnipeg com-pleted in December 1908 is a steel plate girder viaduct 2 274 feet long between abutments and 184 feet high 2.212 feet long octween adulments and 1st rest uses from base of rail to low water or about 139 feet aver age height above ground. It comprises a 170 feet deck truss span crossing the main part of the rive channel one 70-feet plate girder span and fifty one 50cuations one review plate greer span and fifty one 58-foot plate grider spans whiting on twenty at steel lowers. Thus the tower spans are of equal length with the intermediate spans, i = 50 feet. The substructure is of concrete the two fiver piers and most of the land footings being founded on piles.

### THE NEW NAVAL HARBOR AT DOVER

#### BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

The harbor facilities of the British Admirally have been greatly extended by the recent completion of the new and extensive works at Dover at a cost of some we made attensive works at Dover at a cost of some we made attensive works at Dover at a soil of considerable strategi daylogood. Dover is a point of considerable strategi

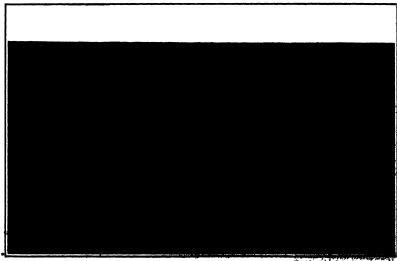


General view of the harbor from the east

cal importance and the necessity of some refuge for war vessels in its vicinity was advocated some hun dreds of years ago Unfortunately however its geo-graphical situation is an h that it is exposed to sill cass between extreme cast and extreme west the

into a harbor of refuge easily accessible in all weath or a and which would be ompletely act necessitated claborate development works

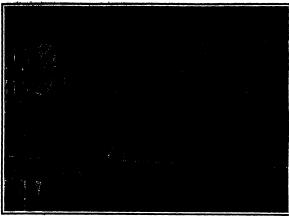
It was in 1886 that the government decided to con-vert the port line a national harbor with a low water



Reclaimed area in foreground of 22 acres where blocks were proposed and studied and work in besteeping a partial with

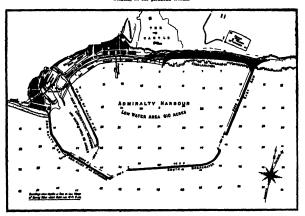
to which the new constitution is in distinct by the nestions indicated in full black. It m reif black. It will thus be seen that an aggregate length of 11 154 feet or over two miles of break water has been miles of break water has been constructed. As case to the an aborage is so cured by a gap between the west ern extrainty of the sea arm and ern extremity of the sea arm and the Admiralty pier 740 feet in width and on the width and on the matters of the hard on the matters of the broader of the hard will be seen that at high spring at high apring tides the water depth is about 60 feet Within the harbor itself a harbor itself a water depth at low tide up to 40 feet is available thus meeting the requirements of the largest war vessels The com tract for the un dertaking was placed in 1897 with Messer S with Messrs S Pearson & Sons Ltd of London to whose courtesy we are indebted for the accom

panying illustrations
The surveys
showed that the
sea bed consisted
of chalk chalk
mari and finis
so that a solid
foundation could
be secured for the
matchiny work
The work is car-



At extreme left, greb for clearing foundations as right, diving bell ready to descent At rear crases for setting blocks below it e water level

Stagring: at the prophess works,



Plan of the Dover harber works New structure shown in full black

ried out in solid mason rich and mason rich and mason rich and composed of 5 to 1 concrete and composed of 5 to 2 concrete and form the sea and here two form and the concrete and form the sea and here two corrected The material for the material for the material for the material for the material to the top of the concrete and form the concrete and the

Actual construction was carried out from slab-curved out from slab-curved out from slab-curved out from slab-curved out from slab curved of the state of the slab curved of the state out of the slab curved out from slab



Congleta view of Dover Say and Marbor

#### Scientific American

ing. The subaqueous work was accomplished by means of diving bells. Most of these had an internal measurement of 11% feet by 10 feet and 4% reternal measurement of 11% feet by 10 feet and 4% feet headeroom with a weight of 35 tons when out of water and about 5 tons when submorged. They were fitted with 5 tons when submorged. They were fitted with either left lighting. The ness hed was first cleared by such the lighting free feet of the grade accurators to within about 15 inches of the regulation level. Then the diving bell descended and the men within completed the work and excavators to the chant 3 feet below the level for the foundations of the chant 3 feet below the level for the foundations of ic about 3 feet below the level for the foundations of to about 2 reasons the sever rity of the scour the superstructure. Owing to the sever rity of the scour and tidal action the foot of the breakwater on its outer lace is protected by a masonry apron about 25 feet in width built up of concrete blocks ranging from 9 to which built up of concrete blocks ranging from 8 to 4 tons in weight and 8 feet 6 in line deep. The bed for the aprox was excavated to a depth of 2 feet by divers. From foundation level up to low water the blocks are brief 4 together by varying the length of the blocks and are develed in the vertical ploins with 4 to 1 concrete sammes dowels of circular section. Above low water the courses are bedded and grouted in 2 to 1 cement mortar while the outside blocks above this point are faced with granite the stones being well onded into the concrete matrix

The reclaimed area lies at the foot of the cliffs and The reciaimon area lies at the tool of the citims and has a length of 2 300 feet by a maximum width of 350 feet the space being some 22 areas. On this expanse it is intended to creet the various buildings required for repairs stores and so forth as well as two protor repairs stores and so form as well as two pro-tected reservoirs for the storage of gasoline for sub-markers a station and depot for which is to be estab-lished her. The essatem arm projects seward from the eastern extremity of this reclaimed area in a south erly direction for 2942 feet. The construction of the southern breakwater was among the most difficult of

taking owing to its exposed position and the great depth of The average depth on this section of the foundations be low low spring tides was about 47 feet the was about 47 recogratest depth being 58 feet Work was gust 1904 and by De rember of the same year 480 feet of foun dations was complet ed and the masonry brought up to the level of low water When the extension had been completed and the plant there need was transferred to the island section work was maintained pressure 2000 feet of foundations bein=

completed in a year while in two months alone 114 blocks were set in position

The width of the structures at foundation level The width of the structure at foundation level ranges between 62 and 77 feet. In the case of the sast orn arm the width at deck level is 47% feet while that of the southern breakwater is 40 feet and the Admi ratity pier extension 45 feet in all cases the height of the deck level above high water spring tides is the

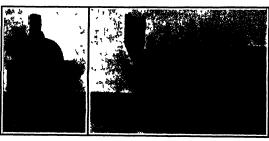
of the deck level above high water upring tides is the man wit a 10 few of the existing Admirably with reas-commenced that the testing Admirably with reas-commenced that the 1890. This arm was to be don-bled in length that is to 4000 feet and in this case owing to the existence of a revolving gun turrer on the old pier head which it was do tided to retain the pier hald to be widened for a distance of some 800 feet in order to permit it o raticost threats serving the steam shin berths to be laid

Both the western and eastern piers are provided with a parapet 11 fect and 10 feet wide respectively the top of the former being 43%, and that if the latter 39 feet above low water — The deck of the south break r however is quite level though similar pro-

vision can bere be made if and when desired.
The works have given employment to from 1600 to
1800 men and consid ring its character the accidents
and fashittles have been insignificant. No deaths or
permanent injuries were recorded in consection with
working in compressed air citizen in the titing bulls
or diving drasses. During construction neveral sent
ing locidents occurred. While the south breakwater
was under construction the liner "houstechhand man
into it seriously drassaria its stem and removerar a into it seriously damaging its stem and removing a mass of masonry. As a result at veral blocks had to be removed and reset. To carry out this work as in gratious hydraulic ram was especially evolved compris-ing a horizontal cylinder having vertical rams capable of exerting a lift of 180 tons by mohan, of which the

blocks were lifted so as to be gripped by the Gold cranes and then reset. On another occasion a ve-while entering the harbor found the timber stellar The collision was so violent that the two starks "ranes were carried away and considerable date rance were carried away and considerable skin nilicted Severe delays cocurred through gales, consequence of the exposed character of the positive full force of the southwesterly and easierly sto was experienced the waves sweeping over the wor Owing to the elaborate precautions adopted however Uving to the elaborate precautions adopted nowwer no valuable plant was lest though at times the heavy staging showed striking evidences of the battering by wind and wave It may be mentioned that the quan-tity of water required during an ordinary agring tide and which flows through the two entrances is 17000

A NOVEL BOLLER AND FURNAGE CONSTRUCTION The furnace and boiler illustrated in the accompa The formace and boller illustrated in the accompany ing engraving possess many decidedly novel teatures which nevertheless have proved efficient in practice. The grains of the furnace is enured up at each ride of the boller as that the forward part of the boller is half submerged in the foul which comes in direct contact with the boller ishell. The fire burns it way up through the coal which as it is consumed feeds downward from opposite submerged in the will be will be the sa downward farth through the coal while there is a downward farth through the coal which carries the gases to the bottom of the furnace and here they combine with air that passes through and nere they combine with air that passes through admissions at each side of the sab pit and flows be tween the grate bars up through the incandescent fuel The burning sases then flow through a nar row neck into a corrugated flue of large diameter which conducts them to the rear end of the boiler after which they pass through the boiler tubes to the



Front elevation and longitudinal section abowing the curved grate and interior details of the boiler.

#### A HOVEL BOILER AND FURNAGE CONSTRUCTION

stack Great care is taken to proportion the stack to the surface area of the tubes and flue so that the highly headed gases will pass alovely through the highly headed gases will pass alovely through the business and the surface of the formats of the surface are precised with recking bear thick may be sperated individually but they are preint and proportion of the furnace are precised with recking bear thick may be sperated individually but they are preint proportion of the present precise and considerable to a single shaft as shown in the li lustration by which they may be presided with a section which may be reciprocated lengthwise whose shaking down the side may be preciprocated lengthwise whose shaking down the side with the track to the total to the transace such as the production of smoke the preciprocated to the furnace consists of the safe pit which are provided with dampers to expected with the table of the safe that the since terms the side duties along of the safe pit which are provided with dampers to expected. stack Great care is taken to proportion the stack to

to regulate the in take of air
Is the spring of 1907 one of these batters was in In the suring of 1907 one of these betters was in-stalled in a factory at Down N J to thick the place of two bollers of 50 and 64 horse-power respectively. The sew boller on the usual rating of green area to the tabe and five area should have generated about 17 horse-power to tunder test it was found to develop 85 horse-power. Former's a stack 195 that high was required but with a new boller the sight wish ri-duced to one extending but 35 four above the boller stands to one extending but 35 four above the boller due to the state of the development of 154 place was give was 9 inches wife and 164 business long with the five was 95 inches wife and 165 business long with the low was 95 inches wife and 165 business long with the low was 95 inches wife and 165 business long with the low was 95 inches wife and 165 business long with the low was 95 inches wife and 165 business long with the low was 95 inches wife and 165 business long with the low was 95 inches just house possibility ever place

..... and we are interpret that it is diffuse spiritually better. The principles define for it so, but it is spiritually appeared to be a possible of the possible of the principles of attention forms better for white complete on a statent spiritually and the principles of attention for the possible of the principles of the

good savighs.

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At the Compens of German description of Pranched Compens of German description of the Pranched Compens of German description of Pranched Compens of German description of the Compens of the German Continedate of the German Continedate of the German Continedate of the German Continedate of the Section of a new bulbon gas of a specific nor of a new bulbon gas of a specific of Compens of the Comp of specific weight was used. However on the basis of the official international figures above stated the litting power of the new balloon gas would bear a ratio of 1000/1000 to the litting power of hydrogen. natio of 1000/1000 to the lifting power of hydrogen. This would mean that a balloon of a objectly of 1000 cubic meters would be able to lift 200 kilogrammes

more than a balloom of the same capacity filled with coal gas, or else the size of a bal loon with the same lifting power sould be reduced by 30 per

This balloon This ballon gas contains upward of 80 per cent of kydrogen while the content of methane which was the speet difficult to decompose is reduced 5 to 7 per cent. The gas has only a very slight odor which is likely to prove very convenient to passen gers in the case of free balloons with open charging tubes. Furthermore it con ruthermore it con tains neither bennol nor any other heavy hydrocarbon capable of attacking the bal-loon cover The theo-

retical fact that coal gas is decomposed by great hab-retical fact that coal gas is decomposed by great hab-which is underlying the process has long been known and seems to have boun first discovered by Basis about forty years ago. However the difficulties on the about forty years ago. However the difficulties on the unitary of the process of the process of the process of the conference of the process of the process of the process of the greater than had been supposed. The shall be processed to consist was to revidence that me admits the profitagor on-cosist was to revidence that me admits the profitagor oned by great he greater than had been supposed. The most important point was to produce this gas during the ordinary op-eration of the gas works and in the same retorts in which the ordinary coul gas is generated. The in vasior therefore used the vertical retorts of the Das-sett gas works. He is now engaged in experiments in east gas works after the process is adaptable also to incrinatin retorts and other types.

The Washington Aqueduct after forty-six years of service in to excellent condition according to the last samula report of falor Jay J services of the United States Corps of Engineers. The except contact the United States Corps of Engineers. The except contact the United States Corps of Engineers. The except contact the United States Corps of Engineers. The except contact the engineers of the engineers of the United States of the Engineers of the Engineers of the United States of the Unit

According to the National Age Gassile, for an according to the National Age Gassile, for a control of the Age Age Gassile, and the Age Gassile of the Age Age Gassile of the Age Gassile

## CURIOSITIES OF SCIENCE AND INVENTION

Explanation of Calabratic All Venomentous Princes
A how makind of contyping persons who are unquantions, below, or otherwise incapacitated in being
consolone, below, or otherwise incapacitated in being
that you have been been been been been being
that the property of the princes of the converted and
that little my on his kness after which he is pisced
there little Executant a shoulder The new method con
the little content as chooled or The new method con actors the Eremans shoulder. The new method con-sistent effecting the burden screen the back over both shoulders, itselested of one as herestores. The right thigh and right upper arm of the man that is being curried are gripped between the firemans arms and frequents and both legs free. Furnerity the fireman had the use of but one hand and arm making it a dif-ferent matter to carry a victim down a scaling index With the new method the weight of the burden is supported in a position where a meanium load on the curried with minimum searchem. The one that is the poverful massless of the shoulders and upper respond is armly located on the inventors and upper the powerful numerics of the shoulders and upper arms. With both forearms and hands free the fir-man can carry a burden down a vertical ladder without damper of failing and can sven side down the ladder after a little practice. To Dr Charles H Duncan whose work at one of the emergency hospitals of this city has brought him into contact with firemen s injured at fires the New York Fire Depart

How long did it take you to make them? I in

"Time" Oh don't mention it I didn't dare keep any record —Edward F Biselow

#### A VACUUM CLEANER FOR CLEANING STREETS.

A VACUUM CHARME FOR CHARMES STEETS.
The war against deat which is now so seconstully waged in houses by means of vacuum cleaning run actions should undoubtedly be extended to in lude street cleaning. It is just as important to keep the dust down when sweeping street and more so because street dust is always heavily indee with disease gorms which are a constant meanes to passerely and par which are a constant meanes to passerely and par which are a constant meason to passerely and par-ticularly to the street sweepers. A ma hine has just been perfected with a works somewhat on he trid notice of the mainler household need undersore. The dirt and refuse of the surface or r whi is the machine travels is gathered by rocksting breades and then by posumatic power is enached or littled into oudsits where the heavite parts of the refuse are extra ted and where the heavite parts of the refuse are extra ted and where the newire parts of the revues are extra ted and deposited in closed receptacies. The fine dust which it has been impossible for mechanical sweepers as heretofore devised to dispose of its carried onward in closed conduits and we ted down so that it may be

taken off in the form of silt.

The suction me hanism is operated by the engin



A curious motor ambulance for dogs is to be seen in the west end of London This ambulance is the property of the Animals Hospital and is used for reying dogs to and fro It res



MOTOR AWBULANCE FOR BOOK

Ark in shape and is drawn by a 2 horse-power motor ye e to which it is atta hed by means of an ingenious coupling device which prevents the ambu lace correcting when raveling around corners The ambulan e is mounted on easy springs is fitted with penumatic tires and is well padded inside in order to minimize wibration. Being motor drawn it can do nog jo rneys expeditionity and siling animals occurred to the buspital and treated without delay be conveyed to the buspital and treated without delay.

#### A HOVEL BRIDGE CONSTRUCTION

A RUYLL EMINEA COMMITTALE AN AMERICAN METERS of SIderable meri was re ently exilbited be fore the Britisl War file It opprises only three different lieves ill strated at AB and C in the across nanvine sixth h. The last A is the compressional different jecces ill strated at A B and O in the account panying sket h The jart A is the compressional m n ber and is the only part while would have to be arried in stake Parts B to d be chopped out of time bor gr wng in the vi inity while he tile rode O could bo for ned on it e sto of rope r preferably wire The construction of the b idge will be unders ood by referring o the menbers shown it dotted lines at the right hand end of he i ridge A rossbar which runs through th last compressional members of the bridge through th last compressional members of the bridge serves as a pivot for two more compressional in mbers that are one ray fulcious of hereon. When the tow compressional me bers are swing around as included by the arrows the iter roll is drawn taut and serves to take its abare of the load. In building up abridge of this sort the o ter and o old be supported on a boat or cost one while the engineers are adding the successive pairs of members to the shore end of the bridge until a sufficient span was produced to rea h acress the s ream. The oustruction was designed particularly



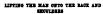


GARRYING THE MAN DOWN A SCALING LANDER.

eat is indebted for this new and practical method of carrying an unconscious person

#### EXPERT CHAIR WRITTLING

For several years I have been collecting specimens of expert jackknife whitting Among those who have contributed specimens is Mr George W Lockwood contributed specimens is Mr. George W Lockwood Long Ridge Colon. About two years ago he supplied some specimens of chaid whitting from a broom stick that were fur above the confunry. For a time I regarded them as the best in extenses. A little later I obtained some triple chains. From a Philadel later I obtained some triple chains. From a Philadel word whose attendion was called to the Philadelphia word whose attendion was called to the Philadelphia word whose attendion was called to the Philadelphia word with I Lockwood determined to go him one term and the results were the two chains and ornat causes shawn between the Theorem to the transition of the costs and skillfully done. The inner glasses turn fly in sets or sections. As will be readily seen links are symmetrically shaped and well finished



whi h propers the much ne tile pow r f tile exh s being utilized in the process of separating and relu

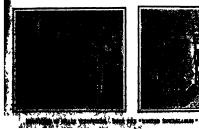
By actual tests recently made nder the n a



HOVEL TEMPORARY BRIDGE CONSTRUCTION

enditions this sweeper has shown its ability to in an hour as much stree a rfa e as the old oned horse-drawn sweeper will sweep or brush in

for se in reinfor ing a on rete arch. When used in this way the ompressional bars ould be placed at the utside and after the concrete lad set they could be removed for use in building the next arch.







VACSUM CLEANER FOR CLEANING STREETS.

#### RECENTLY PATRICES INVESTIGATE.

POTABLE PATERTED INVESTIGAT.

Portabling to Appears,

(WRILE-PASTERIER AND COLLAR

NON-T LEAVORTE, Portland, One The

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starched collar, and which in list pre
flores effectually conorais the tile far

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y be produced by other means.

DALMO Primes. I Wroten, J. Lan-cater I. Rosen, J. Lan-cater I. Rosen, J. Lan-ter I. Land I. Land I. Land Land II. Land I. Land I. Land Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land I. Land Land I. Land I. Land I. Land I. Land I. Land Land I. Land Land I. La

folding sides in position with respect to the control of the contr

operates making the spiles of a parameter of a para

#### Of General Interest.

Of General Interest.

COAL-HARKTT-II of Microstl. New York, N Y The atm in this improvement is to produce a baster especially adapted to be not produce a baster especially adapted to the and which is provided with a reinforcing frame giving the finished basket strength and durability for handling out or the like Feet project below the bottom of the frame to receive the principal part of the wear across the surface for our

List and the presence part of the weat across and across of markers por strike Court IV COURT ARTHAGE, PAR OF THE COURT IN COURT

hato exist.

TOPPRING FOR BOTTLES INTERDIBLY

TO CONTAIN VOLATILE LIQUIDS—1

Geries enables a expilitary office of larger of

deries enables a expilitary office of larger of

derivers exists. Debted in modelin precise to

be stoppered. It may be utilized for ethyl

derivers exists, volatile products either mixed

or not with medicinal ambetances or with per
funery ownerses.

tamory own-twee.

AREA FINDING APPARATUR. APPRING C
FRINKAR, Norfolk, Va. The invention comprices fast steel plate that is magnetized
and a number of smit iron balls. The drawing
pon which he are is outlined in justed over
with that iron balls. The magnetized pair
with that iron balls. The magnetized pair
causes then to cling to the plate and to such
other. The balls are then taken out and
placed in a measuring frame, and the number
of square inches occupied by the balls is aserritated.

EYPA-11ADE J A BLACKETOCK, Sectile, Wash The object of this invention is to pro-tible a shade which will effectually prevent light rays from reaching the cycs, and it is expectably adapted for new by people desiring to step in the daytime. In order to obviate the necessity, of darkwing the room.

necessity of darkening the reas.

(ATTROCOUN). Me forecaser, Berlin, Cornell and a very consequence comprises a best consequence of the consequenc

Reaction and Lightings.

ADMITABLE HANDER FOR LIGHTS—
In Human Higher Wash To propose of the breview of a large or the propose of the breview of the profits saved destined of a large or the like from an overhead cap, port, and reach the veryful additional to review of the large of the like from an overhead cap, port, and reach the veryful additional to review of the large of the panels with the large of the large of the panels with the large of the large o

#### Legal Notices

#### PATENTS

INVENTORS are Munn & Co., 861 016 F Servet, Wa to securing valid, po

MUNIK & CO., 361 Breadway, New Breach Office, 625 F St., Westington,

#### INDEX OF INVENTIONS For which Letters Patent of the United States were issued for the Week Ending " January 11, 1910,

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## This is the Flag Peary Nailed to the Pole



one from to in rit at h return norther upo to h Wangers Hensingh a. I and I let Cape Morris Josep.

Cape Thomas M bland 4 — upo Co-unité just Paux P rits et h rits 177 6 — 900, and 6 a the

Maria Pale D male P H B M A PM E Pharma

The most significant trophy of modern times. Warmed by the midnight sun and drenched in the fogs and snows of the Arctic, it has waved at the apex of the earth, where a day and a night are a year, and every direction is south No battle flag was ever planted in the enemy's stronghold after struggles as severe as those which carned this banner to the goal It is the Star Spangled symbol of courage and endur-ance and faith beyond comparison It is the emblem of man's conquest over every obstacle, the triumph of spirit over matter

We have taken this priceless trophy, symbolical of all that is strongest and most enduring in American character, and have reproduced it in fac-simile in colors on the cover of the February number of Hampton's Magazine Every man, woman and child in America should preserve this reproduction among their most treasured possessions. The magazine can be bought, but the flag cannot-like all priceless things, it can

only be given away
Read Peary's Own Story. Now appearing
exclusively in Hampton's Magazine Every
instalment is complete in itself. In the February number Peary tells about selecting the I skimos for his last expedition, and describes

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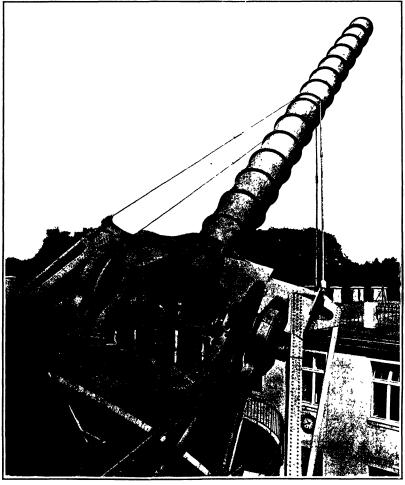


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MUN' & CO Inc., 561 Broadway, New York.

NEW YORK, SATURDAY JANUARY 29th, 1910

The Kilton is always gried to receive for examination illustrated articles on subjects of timery interest. If the photographs are slope, the articles short and the facts subject in the contributions will receive pictal attention. Accepted articles will be paid for at regular space rates

#### WAVE VERSUS SHIP

AS it a last despatring protest of Old Occur, when he lifted his giant hand in the blackness of the night of January 10, and smote the Lusitania' a blow which racked and splintered her lofty bridge and pilot house, 76 feet above the sea and crushed down her forecastle deck and decks beneath, giving them a permanent depression of several inches? For time was, and not very long ago, when the ma was the undisputed ster of the ship, and whenever Neptune saw fit to measure or the amin, and whenever represents saw into open the vials of his wrath and send his league-long rollers arross the deep the proudest ship of the day must needs stop at his bidding if she did not lades of turn and our before the tury of the blast Of late years, man, by virtue of his knowledge and mechanical skill, has been building in ever increasing lengths and breadths, and with such ceaseless en largements of bunker and boller room—he has so multiplied horse-power, and has called to his aid so ingenious contrivances for speed and strength and safety, that old Neptune must for many a decade past have for seen the humiliating day when he could no longer hold the destinies of the bold sea voyager in his hand, and no longer say to him. Thus far, and thus slowly shalt thou go! Following the hint of ultimate victory which was

piled by the "Lusitania" and 'Can that wonderful ship of the Hamburg American Line the "Doutschland," and the even larger and more powerful 'Kaiser Wilhelm" and "Cecilie' of the power-in Amer winders and with the advent of each glant vessel, man a growing mastery of the ocean was shown in ever increasing speed, and a closer approxi-mation in times of departure and arrival to the regu larity of transportation on land

was reserved for the steam turbine to supply the last mechanical device which was to give to man in his age-long struggle with the elements a weapon of complete victory, for in the combination of size and sirrogth and power afforded by the latest turbine liners there has been developed a ship which has illners there has been developed a sulp warm man demonstrated its ability to drive at full speed and all day long into the heaviest seas that the stormy North Atlantic equid pile across her path The writer will not soon forget a notable day some two winters ago, when the 'Lusitania, in weather which varied from a gale to a full hurricane, averaged for the twenty four hours a speed of between twenty-six and twenty-seven land nills an hour During the tumust of that tremendous struggle tenton anchors were shifted, it is true and steel derrick booms were swung athwariship and twisted as if they were no stouter than a boys tin whistle. Yet the ship steamed stated in the whole tabets of her hull

Ordinarily a transatiantic liner will drive her way against a westerly gale voyage after voyage, with no more serious hurt than the bending of a stanchion of the breaking of a pane of glass in the pilot house But onto in a long while there may come a com-bination of sens which are so related to the length of the ship that she may be riding down one wave, with her bow buried deep and her forecastle deck awash just as her stem drives into a roller, steep of front and of yast height. Then it is that the structure of the ship marks its moment of suprems trial and not even the officers 75 feet above water, are safe from the full impact of a solid Atlantic

On the Monday night in question, because of the tempestuous weather, the glass windows in the pilot temperations weather, the gloss windows in the pilot house had been lowered and the storm windows built of solid wood with a small heavy glass port light in the tenter, had been raused. The stern of the, ves-sel was lifting high on a recoding sea, and the form-

castle deck was awash, just at the moment that a wave of gigantic proportions loomed up at the bow. From the over the pilot house and the compass stand upon its roof, which latter is at least 80 feet above the normal waterline, this wave must have been som 35 feet high measured from the trough. The se 35 feet high measured from the trough he see was braking and therefore the mass of water must have had considerable forward momentum. The ship itself was running at half speed, and met the sea at a speed of from twelve to thirteen knots. When the mass struck the breastworks and pilot house, every one of the stout wooden storm windows was burst in, the woodwork being stripped clean to the zantes, and the stout steel framing between the windows was forced several inches into the pilot house. The sea ard, driving a piece of the woodwork bodil; through a hardwood casing containing a portion of the fire-fighting apparatus. The quartermaster was borne back against the bulkhead behind, carrying in his bands the wheel which was torn from its at The mass of water then swept into the office room and staterooms, filling them breast high with and this, be it remembered, at an elevation of 75 feet above the normal sea level

v, since the ship is some 80 feet broad at this point, and the distance from the pilot house to the stem must be at least 150 feet, and since, in order to roll over the pilot house, the waves must have been some 35 feet in height, at least 4,000 tons of water must have swept over the forecastle deck-as anyone with a pencil and pad may easily figure out for him self. It cannot be possible that the wave fell with much vertical impact, or the decks would have crum pled up like an eggshell, but the momentum was sufficient to crush the forecastle deck and the three decks below a few inches down into the body of the ship, leaving them with a permanent set Dramatic evidence of the enormous stresses to which the ship was subjected is afforded by the stanchions and solid steel bulkheads below the deck, which in some places, burkled out of the vertical as they yielded b neath the load above Had the 'lustania' not been built of special strength to stand such buffeting as the results might easily have been very serious indeed. and we are inclined to agree with her captain in his belief that many smaller and less stoutly built ships, disappeared utterly at sea, may been sent to the bottom by the crushing in of their under so-called tidal waves"

#### IMPROPRIATE PRESONANTES IN PRINCIPLE WORK

THE University of Kunsau has inaugurated a system of Industrial Fellowships, based upon a broad,y similar practice that has already been followed to some extent in Some three years ago Prof Duncan of the Europe Department of Industrial Chemistry directed the alon of manufacturers to the necessity for greater technical efficiency, and sugmented that this might be oted if the manufacturing interests in the field of industrial chemistry co-operated with the universities by establishing fellowships for research in cer ties by establishing renowanps nor receases an ex-tain specified directions. At the present time elseen followships have been established of which eight are not no peration. A full discussion of the scheme will be found in the current issue of the Suprepart, but the general scope of the movement may be gathered to the control of the following fellowships. from a consideration of the following fellowships lished

A renowany for an investigation into the chemistry of laundering, with a view to saving laundered fabrics, \$500 a year with 10 per cent of the profits. An investigation into the Chemistry of Baking estab-lished by the National Master Bakers' Association,

with the object not only of improving the chemistry of bread but of providing for the association of a trained expert on whom they could thereafter rely, \$500 a year together with a sum to be settled by arbi-

An investigation into the relation between the optiproperties of glass and its chemical constitution, \$1,500 a year and 10 per cent of the profits.

The discovery of new utilities for osono, \$2,000 s d 10 per cent of the profits.

year and 10 per cent of the profits.

The general form of the agreement calls for an investigation to which the holder of the followship stress his whole time and attention, with the exception of three hours a week which he devotes to work of instruction in the Chemical Department of the University The Pillow, who is appointed by the chancellor and other officers of the university, much have a resolution other officers of the university, must have a reputation in research, must be a member of the university, must in research, must be a member of the university, must work under the direction and advise of the Professor of Industrial Chemistry, and must forward through him to the industrial company, the decroy of the fellowable, periodical rejorts of the progress of big work. All discoveries made by the fellow during the tenure of the followable become the property of the industrial npany, subject to the payment to the fellow of 10 cent of the net profits. In the event of any disagreement between the donors and the holder, the chapterior of the university, or his appointes, is mu-

tually accepted as arbiter

The advantages accruing from those fellowships, according to Prof Duncan, are that the university gains increased opportunities for premoting research, that it obtains three hours a week of gratuitous and skilled instruction, that the manufacturer obtains the ad-vantages of vantly increased laboratory facilities and full library facilities (for lack of which factory re-search has been most seriously hampered in the past) that the manufacturer has consultative advantages, since the fellow appointed is at liberty to question specialists in the different fields of chemistry, that the manufacturer is freed from supervision of the wor research, and that on the termination of the fellowship he obtains, if he so desires, the services of a man cated to this particular need. As resards the fellow, he co-operates in the advantages above ascribed to the manufacturer, he obtains an inside knowledge of facmanufacturer, he obtains an inside knowledge of the-tory processes, and he is freed from the petty inter-ferences and jealousles of shop employees and the "pot shop" judgments of factory officials. Moreover, if he makes good, he obtains a position for which his train-ing during the fellowship renders him peculiarly qual-

Finally, since at the end of the three years' term all work done under any fellowship must be published free to the public, the latter becomes one of the most neficiaries of the new system. The inserrtant l tion of this last clause was at first resisted by so of the manufacturers, but in the end the donor, when it was pointed out to him that a really progre manufacturer would find that three years would give him a sufficient start of competitors, with objections

#### THE MOON AND BADIO-ACTIVITY

THE ROOF AND RADDO-AUTIVITY.

HIS probable infunence of the moon's movement upon the radioactivity of the sir is brought out by M Paul Besson in a paper who fine presented to the Anademis des Sciences.

We fine the radioactivity of the rin and M besson constudes that this radioactivity of the rin and M besson constudes that this radioactivity of the made with the radioactivity of the rin and M besson constudes that this radioactivity of the radio ground, as Elster and Ueltel also suppose He made-experiments in the summer of 1908 and 1909 and showed that the variation in the activity of mineral showed that the variation in the atmospheric pressure, being highest when the pressure lowered. Other authors ob-served the same fact. When the barometer descends the emanation from the soil increases, and the con-trary. But he noticed other variations which were unaccounted for, and thought that they might come from the tidal movement of the earth's crust, which was shown in a striking way by M Charles Lallemand of the Bureau of Longitudes When the moon passes the meridian it causes a tidal wave in the earth a crust, and the emanation from the soil is maximum at this moment, and vice verse, at least as may be d The author's observations lead to the following conclusions As regards atmospheric pressure for a one-hour test w hich is constant w aione for a one-hour test which is constant with rela-tion to the moor's passage at the meridian and thus-sceluding the moor's influence, the radio-activity in-creases when the atmospheric pressure decreases, as-shove noted. As to the influence of the moon, we find that at a constant barometric pressure, the activity is maximum for the passage of the moon at the meridian and minimum for the passage at the other side nuthor hopes to make a more complete series of ob-servations in order to establish his hypothesis. If the law of variation of the emanation coming from the earth could be established, we would ascertain the principal cause of the variation of the air's radio-activ-Should it be found that the moon's movd changes in the radio-activity of the air, we CAU would have the proof that the moon has an influence e changes of weather, according to the popular belief, this being caused by multiplying or lessening the centers of condensation of water vapor, outside of air pressure effects and others.

Mr T H Svedberg has succeeded in obtaining by Mr T II brether has assessed in obtaining by inter-rolest radiations, collisads scietions of various metals in different liquids. The metal to be purious dealed in different liquids, The metal to be purious contained as the perfectly freed on any surface and contained as the stage covered with the activition in a fint bowl, it is exposed from above to the redictions of a quarte glass mercury lamp. After a few minutes the liquid, when observed in the ultra-microscope, shows the characteristic suspect of a colloidal solution. Different metals and solutions show a rather different behapfor. Thus silver, copper, the and lead were possed in the contained as the contained of the cont

#### Scientific American

#### ENGINEERING.

We note that the Indiana State Railway Commission has recently insued an order requiring that all locomocives encept those that are engaged in switching be equipped with headlights of not less than 1,500 and local than 1,500 and 1,

A train consisting of 130 coal care, each carrying 55 tons of coal, was recently hauled a distance of 125 miles over the Virginian Railway in 8 hours, 11 minutes. The locomotive, which is of the Mallet type, weighed, with the tender 481,000 pounds, and the total weight of the train was therefore over \$1,00 tons.

In view of the continual improvement which is taking place in the maries turbine the outlook for the early installation of the maries gas engine in ships of large power is not very promising. Perhaps the returns of the shirt lies in the direction of small highriture of the shirt lies in the direction of small highration of the shirt lies in the shirt lies in the shirt paper deciric motors direct connected to the propaller sharts.

In the recent placing of a memorial window in Westminater Abbry to fit Benjami Baker, a fitting three was paid to a great engineer and a precedent was sestablished which in this age of technical software most most meet with saviersal approval. The tablet reader "In Memory of Sif Benjamin Baker, Civil Bunjewer, Forth Bridge, Assouan Dam, B 1840, D 1807" It is probable that the series of windows, of which the forms one, will be reserved for commemoration of other funesus engineers.

The weahlp has already surpassed the ocean liter in speed and ash is raidly overtaking her in size the new British armored cruiser "Lion" will be about as long as the "Oreanic" and of the same beam as the "Manuscianic." A surpassed of the same beam as the "Manuscianic." A surpassed of the same beam as the Manuscianic. We have the same that the same t

The really extraordinary increase in the power of reciprocating engines due to utilitiang the exhaust in a low pressure turbine will be understood when it is borne in mind that in expanding steam from any independent of powers to a 28-lanch vacuum, over 90 per cent of the power of the pressure of the reduced the apparation and over 40 per cent of the reduced in temperature occur below atmospheric pressure, or any, from about one pound super beaution of the power of the

We understand that the British government is favorable to the construction of a ship canal across Scotland from the Flirth of Forth by way of Stirling, Lockloman, and Lock Longs, to the Flirth of Cityde The plan proposed calls for 25 miles of lake navigation. It is estimated that the work can be completed in its years at an expenditure of about \$100,000.000 If the minimum depth of 35 feet and bottom width of the feet, with locks to match, the government will be prepared to cooperate with private omterprise

The impervement in read-bod, rolling stock and pretective agential go on American sultreads is show the texture agential go on American sultreads is shown to the Brusen of Relivery News of Chicago, whose atures above that 500 reads operating over 153,000 miles of railway have not killed a passenger during a period of one year. It is true that toward the close of 1900 there was one of those curious suidemies of accelerate which cast a shadow over this record, but the immunity mentioned above shows how wastly we have adwared over conditions of the or fitness years ago

A contract has been let for the removal of the fallen portion of the Queboe Bridge which now lies in a tangsid mass upon the south shore of the river Acreding to press reports the steel is to be severed for removal by means of a mechanical outer, but we do the place much resence that statement, for the reason that the obviously ideal method would be to use the oxyphyrique or ory-actytiens fame, whose apparatus is so portable as to render it ideal for setting pin it he many fulfined presentes which would be to uscessive the contract of t

Compensive sease of concellention and Mallet tonotives over mountain grades on the Southern Protect Haldway, under similar conditions of service, have shown ut read contoxies in favor of the Mallet compensed error the simple, high-pressure locomotive of the superfact type. The Mallet locomotive engowated 7.21 per cent move when per pound of fast, showed 15.45 per cent move who makes per gaine of vester used in per points over the mountain per cent of the period of the sease of the period of cell branch, and because of the granters are and power behalff 1124-per cents move commertes and power behalff 1124-per cents move commertes and power behalff 1124-per cents move commertes and the water, who compounding. The reheating of the feed varier, who compounding. The reheating of the feed varier, who compounding. The reheating of the feed varier who compounding. The reheating of the feed varier who compounding. The reheating of the feed varier who compounding. The releasing of the feed varier who compounding. The release of the feed varier who compounding the sease of the protect of the power feed varier who can be a season of the protect of the feed varier who compounding. The release of the feed varier who can be a season of the protect of the prot

#### ELECTRICITY.

Among the most important advantages of the "Physa-prone-ster" car is the fact that there cars are mafer to passengers getting on and off and fewer accelerate occur from persons assuing rolls. Bitatistics have been compiled for the Chicago relationship with the complete of the Chicago relationship with the compiled for the Chicago relationship with the compiled the number of accidents has been reduced 519 per own.

A recent report of the American Telephone and Telegraph Company shows that at the end of 1999 the Bell companies owned 3,500,000 telephones, while 1,500,000 were owned by companies under contract agreements with the associated Bell companies. This is an increase of 600,000 telephones during the year is an increase of 600,000 telephones during the year miles of which were added last year. Half of the total mileage is underground.

A test of Thomas A. Rélions storage butter; or was recently made at West Ornage, N. J. Th.; or is \$5 test long and weights 5 tons. It was fitted with too 1½-horn-power motors, and the operating cost is estimated at one cent a mile. During the two the car was operated at a speed of treaty miles per bour The motors are operated at 110 volts, and it is claimed the motors are operated at 110 volts, and it is claimed that the latteries.

Il has been reported that the Illinois Tunnel Company of Chicago is about to establish a system comprising 50,000 cleans to short telephone system of the city The new system will cleake connections with the present telephone system of the city The new system will cleake connections with the company to the company of the company to the

Metal Massest lamps are now being used on ships and milroad care. Buth uses were considered impossible a few years ago owing to the frailty of the long file ment required in these lamps, and it was supposed at the time that they could never be used anywhere but on a fixed support and hanging downward Now the filaments are so much stronger that in a recent railroad wreek the metal filament lamps in a car that was completely overturned were found to be in perfect condition and fit for further use in the regular

At a receast meeting of the New York Electrical Solvity one of the speakers, lecturing on the subject of domestic electricity rithered to a certain house that had been designed to be heated and lighthet by electricity alone. The house contains no rithre-ups surves or coal storage room, and the saving in these requirements of the usual coal heating system was sufficient to say for the entire electrical installation in regions where the cost of coal in bith and water about more economical than expendituding is no should more economical than expendituding in

One of our large electric Illuminating companies has found a new field for the consumption of electricity, namely, the Chinese laundry A Chinaman was induced to equip his about with an electric sambing marchine and electric irons, and the photograph of this enter prising forleant with his electrically equipped shop is being sent around among Chinese laundrymen, the grether with a letter writton in Chinese calling atton the contract of the con

A cashelly tabulated record of the reat of electric wagons and home rigs used by the Common state of the Agents and home rigs used by the Common state of the show conclusively that the electrically operated wagon is cheaper than the home drawn whitele and when we add to this advantage the fact that it makes a better appearance, is handler, and can cover ground in less time, enough has been said to show that the electrically operated wagon is far superior to the electrically because of the left of the fact that the electrically because of the risk of the prior of reds.

A thundersterm observatory has been established in Spain by Senor G J de Guillen Gargia-Zi which has been established in Spain by Senor G J de Guillen Gargia-Zi which atmospheric debaptrays. both local and diffeats, she detected graphically she accountionally A vigriesas they are apple instrument is justed for this jurpose, because cach lightning dischings in accounting the proposition of the same stable of t

#### SCIENCE

Lieut Ernest H. Schackleton has announced that he will enter upon another Antarctic expedition. The date of the expedition has not as yet been decided

The Brooklyn Public Library has published a littio pamplet on "Accommution or Aerial Varization, which comprises a list of books and references to periodicals in the Brooklyn Public Library on the sublect of seronautics. The list is fairly complete, and may be reparted as an excellent bibliography of a most timely subject.

A tyramosaurus has been piaced on exhibition in the binosaur Hall of the American Museum of Nat ural History This dineasur measures 40 feet in length The jaws of the massive skill are four feet long and are armed with sharply pointed feeth Tyramosaurus was probably the largest carnivorous animal that ever reamed the extra

The Boott excedition in search of the Bouth Pole is now assumed. The Dirtids Novermane's has promised \$100,000 toward the \$200,000 which is the estimated exposes. A total of between \$65,000 and \$000,000 toward the \$200,000 which is the estimated exposes. A total of between \$65,000 and \$000,000 toward the estimated \$000 toward toward \$000,000 toward toward \$000,000 toward \$100,000 toward \$100,000 toward \$

Many attempts have been made to use old newpapers and other printed sheets in the manufacture of shife paper, but the removal of the printers like from the Bree has billhered presented an insupersible difficulty. In a process recently patented in Germany the paper pulp is treated with akinine solutions of percupapers partially the printer of the large transport of which so slice the grows part of the link that it cases to blind the lamphiles had other pigments, which are then easily separated from the fiber by emulatifying the pulp with gelations silice.

emulating the pulp with golutions silled.

An international agreement for the prohibition of
the use of saccharine has been instituted by the
overless of saccharine has been instituted by the
overless from Germany, Australia Hungary, Belgium,
Greece, Italy, the Nebri rands, Portugal, Russia and
Switzerland, and a meeting of delogates from these
countries was held in Paris, under the presidency of
the Prench minister of foreign affairs. The commission closed its session on November 18th with the
theory of commal prohibition of the use of such
actions of the commission of the saccharing the session of the
other of a formal prohibition of the use of such
actions of a formal prohibition of the use of such
actions of the commission of the saccharing the second of the
will transmit this prohibition to the governments of
the other countries for ratificatives.

A recent German patent des ribes the preparation of a casting mass composed of slaked line and water, with small quantities of skall and a carebujerate 100 parts of a stiff past of well-alked line, containing approximately regard amounts of time and water, are presented with 100 parts of a stiff past of a straining and water are considered with 100 parts of a strain of time and water are qualified with 100 parts of a strain of the company and decomposed by line. The mixture become as a find a large quantity of a peah, the best added to the line, but soon solidifies and retains the form of any model into which it is poured it about 2 parts of evolution would play the property of the parts of the par

The investigation of the spectra of the plants, which was began at Lowell Observatory in 1925, has which was began at Lowell Observatory in 1925, has which was began at Lowell Observatory in 1925, has been provided by Y. N. Shipher. In a built this plant load Shipher founds a combination of dyes which renders the sense twentoe of the commercial of your longer funds the twentoe of the commercial of your longer into the red as far as to wave length 7000 beyond which point it drops rapidly, but its sufficient at A to revord faintly that line in the prismatic solar spectrum. With the ald of this plant the spectra of the red than the properties of the prope

The heat is one of the most valuable of valitational plants. The ord garden varieties furnish savey of plants plants are garden varieties furnish savey the plants regulation, the large forage bests form an excellent vagetables, the large forage bests form an excellent regulation of the principal sources of sugar and alreado! The use fullered this valuable root has not been increased by the production of an edible floor from sugar bests. The dependent of alled sugar bests (Zintkenschnitzel) is already practiced in Germany on a very extensive a deep for cattle in the summer of the sugar best which, according to a pastry and before the recent chundral congress in London to entirely free from the distinctive flavor of the best and is suitable for use in making stakes, puddings, and pastry. As it contains about 65 per cent of sugar it can often be substituted, with advantage, for significant of the substituted of the development of sugar states of the superior of the production and grinding not only real less than the extention of sugar, but preserve at the sugar of the best, part of which is rejected in the form of molasses, in the precess of sugar making.

### A NEW ERA OF THE AMERICAN LOCOMOTIVE

#### TWO REMARKABLE ENGINES

It is not stretching the point too far to say that the design of the locomotives herewith illustrated, one for passenger and the other for freight service, marks a new era in the development of the American steam locomotive This is particularly true of the passen

This has been done in both engines by utilising the great length of belier spaces afforded by the sericulated system of construction. As will be seen from our sectional view, the belier proper terminates above the high-pressure ordinates. The series of tubes, around while the high-pressure ordinates. The shall, however, it is a few the reliculates and for states the takes of the same through a large next of tubes, around while the series of tubes, around while the series of tubes.



Weight of engine and tender, 30 tons. Tractive force, 30,4 tons. Heasting surface, 4,76 square for. Steam pressure, 30 points. Superheading and reheating surface, 1,181 square for. ( Jindebers.) Ten high pressure, Minches by Minches Driving wheelers, 37 techns. The most nevertal nessenger lecemetive in existence.... i new type

ger locomotive, with which, by the introduction of the Stallet articulated piston, it has become possible to haul heavy fast passenger trains which with the present type of locomotive, it is necessary to run in two sections Moreover, so powerful is this engine that it can haul over the heavy grades of the mountain divi sions transcontinental trains which at present call for the assistance of an extra locomotive

familiar, but the tion of the truly recently built for the Santa Fe Railroad is based on its great weight of 850 tons and its tractive force of 54 tons, both of which figures greatly exceed those for any previous freight locomotive Both locomotives were built by

the Baldwin Lotive Works for the Atchison & Santa Fe Rail

The most important novelty, common to both en-gines, and the one which marks a distinctly new era in locomotive practice in this country, lies in the means which have been taken to transform the locomotive from one of the most wasteful into a reason

tended forward to the low-pressure cylinders, and venued torward to the low-pressure cylinders, and within it are placed two nests of fire tubes, through both of which the hot guees pass on their way to the smokestack. The first of these is divided by a dis-phragm into a super hester and a re-heater, the second forms the feed water heater

Now, in the ordinary locomotive the gases, still very hot, after emerging from the front end of the fire tube, pass out through the sme

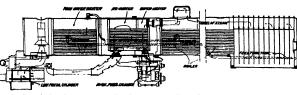
boiling point, as it travels from the tank on the tender to the b the boiler

The advantages of this system are that not only is

a much larger percentage of the heat energy of the fuel turned into useful work, but the super-heating and re-heating enable the well-known economies of compounding to be realised to the fullest extent. a consequence the coal consumption per ton mile has been reduced by soproximately fifty per cent, ten per cent of which

is estimated to be due to superheating and re-heating, fifteen per cent to feed water heating. rud twenty-five per cent to com-pounding These figures are at present merely an cetimate, but We see no real son why, with proper firing

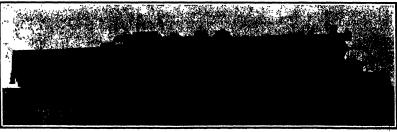
and intelligent handling of the throttle, these should not be realised in actual service The Santa Fe passenger locomotive embodies the first attempt to apply the articulated system to passenger service. The proportions are enormous, far exceeding any existing proportions are monotones, and account of the passenger locomotive either here or abroad As far as cylinder and driving wheel arrangements are concerned, the engine is practically a combination of the (Continued on page 113)



In this builde uset of the best in the Pr which is ordinarily lost through the smokestack, is utilised to superficut and reheat the steam on its way to the cylinders and to heat the feed water before it enters the boller

The new boller which saves 25 per cent of fuel

The Santa Fe locomotives return a large part of this heat to the boiler and engine Referring to the diagram, it will be noticed that those heat recovery devices first serve to raise the temperature of the steam as it passes from the steam dome to the high pressure cylinder Then the gases yield up still more



Works of regime and tender, 20 ton. Tractive force, 5 ton. Hearing surface, (Alt space let, Steam pressure, 30 pands. Superheating and reheating surface, (Alt apare let, Steam pressure, 30 pands. Superheating, and reheating and reheating surface, (Alt apare let, Steam pressure, 30 pands. Superheating, and reheating, and entpending, and entpending entpending entpending entpending entpending entpending, and entpending en

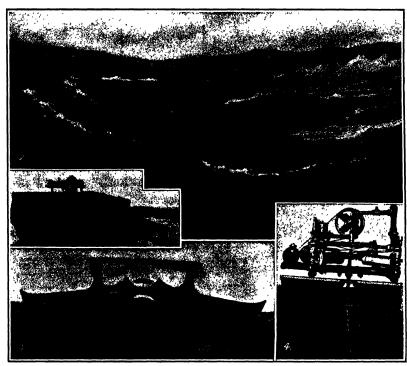
#### PUTTING OLD NEPTUNE TO WORK

Twice each day millions of tons of shipping in New York Harbor are lifted to a beight of over four feet and dropped the same distance by the tide This same work is done in every port to a greater or least degree. Many a man has enviously considered this inditure of power and racked his brains enormous expenditure of power and racred his oratines for a means of putting it to valuable service. How ever, the work done by the tides is enormous only be-cause of its vast extent and herein lies the delusion which many an inventor has failed to discover until which many an inventor has raticd to discover until the has devoted much thought and time on evolving a tide motor. The work done in raising of the "Lusi iania," for instance, which weighs 40,000 tons, repre-sents an expenditure of energy of only sixteen horseis utilized to operate a series of pistons pumping air into a compressed air tank. The compressed air tank and four pairs of cylinders are mounted on the main The piston rods are connected at their outer ends to the four floats and when these floats are rocks by the waves they serve to reciprocate the pistons and pump the air This action takes place regardless of the direction in which the waves are traveling because

the direction in when the waves are traveling because the auxiliary floats extend in four directions. An entirely different method of utilising the force of the waves is shown in Fig. 2. This consists of a large crib placed in the water and having one end open so that the waves will wash up over the floor of the crib as they do on an ocean beach At the back of the crib

rock to and fro the pinion is rotated first in one direction and then the other, and this motion serves to pump air into a tank. The air from the tank operates a manmatic motor which in turn drives a dynam a pneumatic motor which in turn drives a dyname and generates electricity. In order to permit the floats to swing about in any direction without damper of fouling the anchor lines one of the floats is mounted on a swivel which is securely anchored. By means of comtact wheels engaging contact rings on the servel the electricity generated is conveyed to a pair of cables which extend to the shore

The construction shown in Fig 4 depends for its operation on an entirely different principle—it is well known that the wave disturbance of the ocean does



Four novel methods of utilizing the power of the waves, PUTTING OLD MEPTURE TO WORK

r, this being due to the fact that the tide acts very slowly, taking six hours to raise the vessel to a

However, there is another form of energy displaye provery the sanction form of energy analyses by the ocean which is far more powerful than that of the tide, and here there appears to be more opportunity for capturing a portion of this power and devoting it to practical use. The waves of the ocean are not so deliberate as the tides and the chief difficulty with

so deliberate as the tides and the chief difficulty which the hivester must contend to that in time of storm they develop satisfy too much energy and are spit for wreck his satchies. In the accompanying segmenting we liturates some recept constructions which have been develop for the purpose of obtaining power from the waves. That shown in Fig. 1 consists of a darge square flowd only in the property of the purpose of obtaining power from the waves. That shown in Fig. 1 consists of a darge square flow of the purpose of the pur

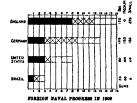
are a pair of curved deflecting walls before which is placed a triangular casing provided with a series of swinging doors or vanes. When the waves wash up the floor of the crib they close the vanes against the casing and divided by the prow of the casing are di-rected against the deflecting walls. The rear of the rected against the defecting with. The war of the infranction causing is opened, permitting the water to flow through as the ware recedes and strike against the rear faces of the vance opening them to the position shown in the illustration. The vance are garden to a series of patton reds which operate the cylinders to fill a compressed-sir chamber. The latter, by means of a pair of air motion operation a dynamo and earlier stress where the property of the pr

not extend to any great depth and it is the relative motion of the surface water with respect to the water at a considerable depth that is made use of in this case to generate power. A float is provided from the center of which projects a shaft fitted at its lower end with a set of radial fins. When the float is rocked by the waves the shaft tends to remain vertical owing to the waves the shart tends to remain vertical owing to these fins. Mounted on the float are a series of cylin ders provided with the usual platons which are con-nected to an extension of the vertical shaft just re-ferred to, and while the platons remain virtually fixed the cylinders are reciprocated upon them by the rock-ing of the float. The pistons serve to circulate oil through a rotary engine which in turn drives a dyna mo and thus generates electricity When the wave motion becomes too violent an electrically-operated by pass permits a portion of the oil to circulate without passing through the motor and thus an excessive speed

#### PORRIGH WAVAL PROGRESS IN 1909. BY PERCINAL A MINIAR

During the year just closed considerable naval activity has been manifested abroad. Not only have the principal haval powers adopted large programmes of new construction and made good progress with those already in existence, but the minor powers have st in a practical manner how widespread a hold th nought fever has taken on the mind of the world

Great Britain during 1909 has finished the last of the trie of battleship-ruisers of the invincible
type, of the details of which readers of the Scientiff AMPRICAN are already fully aware through the appear ance of the 'inflexible' at the Hudson Fulton celebra ance of the 'init. fibe' at the 'itings' me inconservers at those The three battleships of the 1995-7 programme - the Bellerophon, 'Temeratre' and "Buperb"-have all been passed into service. They are of 18,000 tons, 700 more than the "Drasdought," but differ in having sixteen 4 inch 31 pounders for their anti torpedo armament as compared with twenty-for 12 pounders The end of the year saw also the comple-tion of the battleship Vanguard, of the 1907-8 programme which was turned out by Vickers, Sons & Maxim in the record time for any ship since Dreadnought berself, of 19 months. The "St urreationages nerself, of 19 months The "St Vincent and Collingwood completing the 1997 St 170, will be commissioned this spring. All are of 19,250 tons, and have ten 12 in h 50-calibor guns (the main armament of the others is 4' calibors and twenty 4 inch rapid fire weapons. The thickness of the main belt is reduced to 9% inches in these ships compared with II inches in the earlier vessels, but a larger area of the hull is protected by thick armor vessels passed into service during the year include the unarmored cruiser "Boadlers," of 3 300 tons and 25 knots, designed to act as mother ship' to the deknots, designed to act as mother ship to the de-irroyer flotlillas, a number of 31 knot destroyers-"Afridi" (which had to bk accepted at 12 75 knots) "C'usadir," "Aunson" Baracon," "Maori, "Viking" and "Zulu A now type of submarine has been com-pleted This is the 13" of 600 tons, which showed and 'Zulu



d submerged She is fitted with twin-

screws, and has a steaming radius of 4,000 miles.

The vessels launched during the year are the bat-tleship "Neptune," of 20 250 tons, with the same arms ment as the earlier Dreadnoughts, but so arrange that there is a broadside of the whole ten heavy guns, and the armored cruiser "Indefatigable," 19,000 tons, carrying the same battery as the "Invincibles," but longer, enabling a wider are on either beam to be covered by the whole eight 12 inch guns. A number of small cruisers and destroyers have also been

launs led "Three new battleships have been commenced "They are the "Hercules, "Yolossum," and "Yolon," of the same displacement as the "Neptune," but with the five 12 luch gau, turrets arranged axially The armord cruiser Lion, "also laid down will be of 25,000 tons and 2% to 26 knots, and will carry ten 12 inch guns (Hermany has had a reverd year in salval construction Rhe has exampled her first two Dreadhoughts, the "Assaul" and "Wortfalen," of 18,000 tons in the "Assaul" and "Wortfalen," of 18,000 tons

armed with twelve 11 inch and twelve 59-inch gu Both ships exceeded 20.5 knots on trial, although de signed for 195. The armoved cruiser "Blucher" has been commissioned as flagship of the High Sea Floot s need commissioned as magnify of the right sea Front services equation. This reases cannot rank with the littlish 'invincibles, but she is nevertheless a powerful ship, displacing 15,500 tons and steaming 245 knots on trial. Her armament consists of tweive 8.2 inch and eight 59 inch guns, and her main belt is 8 inches thick. The battleship "Rheinland," sister to inches thick The battleship "Rheinland," sister to the "Nassau ' is now running her trials, and the "Po-

n will follow this spring Five large battleships have taken the water during the year Three of these are battleships—the "Out friesland" "Thuringen," and "Heisoland," each of 20,800 tons. They are the first German ships to be armed with 12 inch guns. Krupp's having built a 50caliber weapon firing a 981 pound abell. Twelve of cattory weapon fring a sat point and). I were or these guns will be carried as well as a similar num-ber of 6.7 inch in armam ut at least, therefore, these ships will be greatly superior to any British ship yet launched. The armored cruiser "Von der Tann" has also been launched. She is of 18,700 tons and will steam 25 knots, her armament comprising ten 114noh and a secondary battery, it is believed, of 59-inoh guns. The cruiser "G," following toward the close of

the year, is a sister ship

Two small cruisers, the "Kolberg" and "Mains," have
been completed. They are of 3,800 tons, earry fourleen completed. They are of 3,500 tons, earry non-teen 4 linch guns, and steamed 27 to 28 knots on trial The completion of destroyers continues a fac-tor of naval strength in which Germany leads the world Her truelve vessels of the 1808 programme are in commission at a time when those of the British programme for the same year are only being launched

programme for the same year are only using same and Three battleships have been laid down, similar to the "Helgoland," but equipped with turbines. They are the "Ersats Frithjof," "Ersats Hildebrand," and "Ersatz Heimdall" The armored cruiser "H," of the "Erests Heimdall" The armored crusser "H," of the 1909 programme, was laid down in December, 1908, in advance of the orthodox date. Two more small cruisers, twelve destroyers and some submarines have

n laid down auso seen hat down
All the French battleships of the "Danton" class
have now been launched They are of 18,400 tons and
will carry four 13-inch and twelve 94-inch guns. Admiral Boue de LaPeyrere, the new Minister o has done much for the benefit of the naval service. The next ships to be laid down, two of which will be started at once, will be of 23,400 tons and will carry twelve 12-inch and eighteen 55-inch guns

A start has been made in the re-creation of the Rus-A start has been made in the re-creation of the Rus-sian navy, and four battleships were laid down at the Baltic yards on June 16th last, where they will be built under the supervision of the British farm of John Brown & Co Their names are "Gangut," "Petropav-lovak," "Sevastopol" and "Poltava," and on a displacement of 23,000 tone they will carry twelve 12-inch placement of 23,000 tons they will carry twelve 13-inco and skitcen 47. The designed speed is 23 knots. The two Hlack See batthaships "Andrel Pervouvanni" and Imperator Pavel I" have been completed, as well as the small armored cruiser "Pallada," 7,000 tons. The

the small armored cruser "Pallada," 7,800 tons. The former are 17,856.0m seessle, carrying four 154nch twelve Sheh and twenty 47 fach gunz. The progress of Japan te difficult to follow, owing to the contradictory reports that emanate from that country However, too battlerships have been laid down—the "Kawashi" and "Settsu," of 30,800 tons, armed with twelve 151nch, ten Eloha and twaite 47 lock gunz. The "Satsuma," laid down in 1805, has been passed into service 'Displancing 13,830 tons, abe carries four 12 inch, twelve 10-inch and twelve 6 guns. Much difficulty is found in turning out ord nance fast enough to supply new ships, and the arm ored cruisers "Ibuki" and "Kurama," laid down in ored crimens July and "Aurama," hald down in 1906, are still delayed by this cause. Two new cruis crs, the 'Hukl' and "B" have been laid down. Or 18,850 tons they will carry six 12 inch and fouriest 6-inch guns, and steam 25 knots

Among the lesser powers Italy has laid down four large ships. The "Dante Alighiert' and 'Cavour' (laie "Leonardo da Vinci") will carry twelve 12 inch. "Michael Angelo" and "Galileo-Galilei, reported, eight 14 inch Austria has launched three battleships and proposes to build four 19,000-ton res-sels as soon as financial difficulties have been over come The first of the three Spanish ships, the "Espana," has been commenced, and will carry eight 12inch gune on such a low displacement as 14,780 tons.
The Brasilian "Minus Gerace," with twelve 12-inch has been completed, the "Sao Paolo" is nearly ready. for trials, and the "Rio de Janeiro" has recently be laid down The Argentine is going to have two battleships bulk, and Chile one A Chinese naval commission is touring Europe with the ultimate object of placing orders for three 15,000-ton ships; Turkey has sent Admiral Gamble back to England with in structions as to the ordering of two battleships, and Greece has allotted five million dollars for the purchase of an armored ship from an Italian firm.

#### HOW AN AMATRUR MAY FIND HALLEY'S COMET. BY BEY ROLL W ROLLING. Thinking it a laudable ambition to be the first ama-

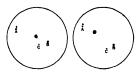
teur to find Halley's comet, I have been working with my 314-inch telescope for several weeks trying to locate it. I have not learned as yet that I am the first, arned as yet that I ar cate it. I have not learned as yet that I am the first, but being confident that I have succeeded in finding it. I have thought that other anastours might like to know how it might be done files the easy method here described may also be employed by sansteurs in other stumps existing of the beaverage. I have gone somewhat mto details. Despite the fact that once actronical journals have said that it would be some nomical journais nave mist tast it would be some time before the comet in question could be seen in a small telescope, I have the word of a prominent as-tronomer that it can now be seen in even a 5-inch-provided, of course, one knows where to direct his

So the first problem is to assertain the position of an comet. There are very few amateurs who have plescopes mounted with circles. Hence we must

adopt a pian that will enable us to find it without such aids. Of course it would be all easy task to locate it if one had all the equipment of an observatory, mersly by setting the telescope in the proper right ascension and declination.

w if we will turn to the recent files of the Scien Now if we will item to the recent these of the Retur-Man and the state of the state of the state of the ADDRAIN, we may find the right assemble and declination given for every either day during January and Pebruary. The data for the intermedister, can be easily deduced by taking half the difference of any two alternate days and adding it to the remove of any two alternate days and adding it to the remove of any two alternate days and adding it to the remove, and is the best for the average student. Both a star attas should be one of the first books owned has a masseur. Almost any good library can reveals you with such an atlast flow is not already at head. These with such an atlas if one is not arry one levrain you with such an atlas if one is not arready at hand. Then with the ophemor's before you follow the ocurse of the comest row day to day by tracing the right ascension and declination on the map. Note the day when the readings first comes near to nome prominent star. This will be the time to put the method to tripl. In order to know exactly how near the comet will be to the star, consult the Nautical Almanac or any other source accessible to find the R. A. and Dec. of the star Upton or other star atlases will give the data for

ome of the stars.
By this process I found that on the eve vember 30th the comet was to be near Aldeburan in Taurus, so I began in good season to make my trial The evening before I made four carefully constructed charts of the stars visible in my field of view used my 45-power eyepiecs, and this meant about 40 minutes or 43 minutes of are, in the field. Upton or page 14 gives the R A of Aldebaran as 4 hr 30 min. Upton on page 14 gives the H A of Aldebaran as 4 hr 30 min., and the Dec as +16 degrees 19 min. The R. A of the comet on this day was 4 hrs 30 min., and the Dec. +15 degrees 55 min. The R A is the same, and the Dec places it 33 min. south of Aldebaran This would Dec places it 22 min, south of Aldecaran This would bring it within the field of view of the telescope. One can estimate quite accurately the number of minutes of arc within the field of view of the telescope by sighting it upon some object whose size is known. The moon is suitable for the smaller powers. It is



rd 11 P. H. cont time. Jan. 14th, 1910 time Jan. 14th, 1910.

A is a small double star, B is a star of the 5th magnitude; C is a very dim star the telepotion of date as Haller's count.

min of arc in diameter Epsilon Lyraes may be used for the higher powers. The two principal stars of this double (in reality a quadruple star) are 3 min apart.

My 200-power presents a field of vision of about 6 or 7 min. Now if the polar axis of the telescope is pointed exactly to Polaris, it would be necessary only to make one map of the desired area and esti-mate the 12 min distance to the south I had my telescope, on this particular evening, directed from a d-story window and was not sure of my exact polar location, so I drew the four maps, hoping to be more certain of including the comet within the list more certain or incinuing the comet within the list. in making such observations and trying for a definite location north or south, east or west, one must bear in mind the fact that an astronomical telescope inverts the object. A little study with the moon, which can also be observed with the naked eye, will help straighten out this matter. Now after making the straightan out (his matter Now after making these form may not he weeting of the 29th, I planned to observe carduly the next eventing to see if I had any object. In view out viewed the night before But the Object. In view out viewed the night before But the coning rising of the moon, while the second risk coming rising of the moon, while the second risk coming rising of the moon, while the second risk in view While I had thus planned to locate the country with the process of addition (and this whule have been to more destrable as it would have anothed a more carried service) a cleded to beef for it the next evening by a process of addition (and this would have anothed as more carried service). I carriedly a leaded to beef for it the next evening by a process of elimination is on the evening of the But I carriedly made four new maps of the sense areas like those shown in the engraving and made areas like those shown in the engraving and made areas in the through the control of the process of the control of the process of the p four maps on the evening of the 29th, I plan

## Scientific American

THE LASE WASHINGTON GAPAL.

A public work of much importance, though not wishely known, is the proposed canal connecting the tidal waters of Fuget Sound with the fresh water lakes, Union and Washington, lying in or adjacent to lakes, Onloin and wassington, 1791 m or acquest, the city of Sentite, Wash. The project is a very old one, though it has yet progressed to further than the angulrement of right-clevary, the formal adoption of a project by the War Department and its submission to Congress, and certain local measures now in progress for the raking of funds to said the government in the

se canal is to be a joint enterprise, to t of which the government and the local community will of which the government and the local community will withmately contribute about equal shares. The local community has airsedy acquired and delivered to the United State the right-of-way, costing about 1500.00 It will excavate the channel at a cost of about \$1,000.00 The railrends, street care commaniss and city will have to construct bridges and other crossings at their own segmens, so that the entire local outlay will prob-shly foot up about \$1,500,000. The government will have the contribute of the contribute of the contribute of the half of the contribute of the contribute of the contribute of the half of the contribute over a contribute works and a newerbuild the lock and controlling works and a power penia to some and controlling works and a lower plant. It will also build the entrance works and take care of certain other features of the project and will maintain and operate free of toll the completed work. The cost to the government will be about \$2,500,000

he cost to the government will be about \$2,500,000 Following are some of the benefits of this work which justify its construction and which also justif a division of the burden between the government and the local community

It will be of great value to the navy by giving an admirable fresh water waiting basin for vessels laid up in ordinary time of peace Puget Sound will al-ways be an important naval rendervous, and the Navy Yard is only 18 miles from the canal entrance.

It will give a much needed expansion to the harbor It will give a much needed expansion to the hartor facilities of Elliot Bay The practically available frontage on the Bay does not exceed 5 miles, and a large part of this is in the hands of the railroads. large part of this is in the hands of the railroad.
The opening of the lakes will give fully ten times
greater frontage than at present, and much of it better
situated for public convenience. It will make accessible extensive sites suitable for manufacturing cetablishments The areas at present available, where both rail and shipping facilities can be had, are extremely

The completion of the canal will give much a The completion of the canal will give much newests are anchorage grounds for shipping Many vessels are laid up during the winter, and owing to the excessive depth of water in Puget Sound, suitable anchorages are very scarce Not only will the lakes afford better are very scarce from the destructive effects of marine life which is very active in the waters of the sound. The hulls of vessels will suffer much less deterioration than in asit water Likewise subaquoous timber construction, which cannot be depended upon for more than a year in the sound un-less the timber is "treated," is practically imperish-able in fresh water. The shallower depths also will ch less expensive for wharf construction and

The lakes are, of course, entirely free from tidal fluctuation, which on the sound has a mean range of 10 feet and an extreme range of 18 feet. The fixed level will be a great gain in all shipping operations.

The foregoing advantages are of a general character, but there are others of a purely local character

ter, but there are others of a purely local character that are very important.

The cost of drayage in Sentile is large because of the extremely newest topegraphy of the city and the water front. The canal will fank the hills, distributing the right throughbout the city and reduce the cost of drayage, it is estimated, by 25 to 50 cents a ten. This suring will in a few years equal the local contribution to the cost of the casal.

The lowering of Lake Wandhagen to the level of The lowering of Lake Wandhagen to the level of

Lake Union will drain all swamp areas around the shores of the lake, relieve the valley of Black and Duwamish rivers of the floods of Cedar River by turning the latter stream directly into the lake, and will make the whole run-off from the Lake Washington make the wools run-off from the Lake Washington and Cedar River watersked (569 square miles) avail-able for power at the lock site. Drainage, flood protec-tion, and accossibility to shipping will greatly enhance land values around the lakes. Lake Union will be-come virtually a great dock in the very heart of the

city. The removal of the natural burrier between the two lakes and the establishment of a connection with the sound will greatly enlarge the field of pleasure bas-ings which already plays a large part in the life of the boal community. Some has is feet that they opened changes will detend from the natural beauty of Lake Wankington, but a careful analysis of the question shows that the affect will be improved; the gives a period of two or three planes, and will re-gister a period of two or three planes, and will re-infer a period of two or three planes, and will re-infer a period of two or three planes, and will re-fer the provinces of the second of the control of the planes.

chamber. The large lock or chamber will be about 800 feet long by 80 feet wide and 35 feet deep and will take any vessel likely to visit Paget Bound for many years to come The little lock will be 100 feet long by 30 feet wide and 16 feet deep and will be used by small craft of all descriptions, the number of which is very large and rapidly increasing. Probably 90 per craft of transfers of vessels will be through this lock

The entire structure will rest on an excellent foundation of very hard, tenacious blue clay of great depth It will be built of reinforced concrete and steel and will embody the best features of modern lock conwill embody too best leatures or mosern love, and struction The controlling works at the lock will con-sist of a power house by which the entire flow through the canal will be turned to use. The great reservoir formed by the lake gives complete control of the run-off and distributes the flow quite evenly throughout the year. The revenue from this power will return the year The revenue from this power will resura about 14 per cent on the cost of the plant and will nearly pay for the future operation and maintenance of the canal. The problem of maintenance will be greatly simplified by the entire absence of sediment stream sumplimes by the entire absence of sediment in the water and consequently of deposits in the canal and the necessity for dredging. The physical problems involved in the building of the canal are of the sim plest character

This canal has been the droam of Seattle er it began its existence, but the rapid growth of the city and the great variety of interests affected create oppo-sition here and there which has succeeded in delay-



This great sait water lake will form an excell r for laying up naval vessels an increase harbor frontage of Scuttle THE LAKE WASHINGTON CANAL

ing the work much longer than should have been the case It is now expected that the project will be com-pleted within the next three or four years

## The Boy's Kndorsemen

Standing fifth among books most in demand during Standing fifth among books most in demand during the week ending January 18, 1910, as reported by the Circulation Department of the New York Public Li Parties, in "Pas Besintle American Boy," by A. Rus-bries, and the Company of the Company of the Company selves counts for more than the many favorable re-selves counts for more than the many favorable re-relyes that this book has reverbed Boys are not in-fluenced by the criticisms that appear in magazine, for to a great extent by selveriments. The fact that they frequently call for a book at the library is once that they thoroughly appreciate that par ar work "The Scientific American Boy" takes ticular work ticular work "The Scientific American Boy" takes up the story of a group of boys with built tree huts, log cabins, caves, bridges water wheels, tents, tramping outfits, etc. A sequel to this book has just been published, entitled "The Scientific American Boy at School," which continues the story and tells how to make a variety of things, including dams, boats, gliding machines, sun disk, cances, and many new devices for outdoor recreat!

Some Curtis turbine driven units of 14,000 kilo-waits capacity are in course of construction at Schenectady What 14,000 kilowatts means is shown in the Current Supplement by Illustrating the amo question shows that the affects will be impressed that the amount of the period of two or three years, and will result in framework that the amount of the period of two or three years, and will result in framework that the amount of the period of two or three years, and will result in framework to the period of two or three years, and will result in framework that the period of two the period of the perio

Albert Moyer, the well-known authority on concrete, presents a paper on the possibilities of the uses of mineral oils mixed with concrete. The treatment of disease by injecting into the blood the serum, or watery part, of the blood of an animal that has been made immune to that disease is popularly discussed by Dr Fritz Meyer Dr V Grafe contributes an excel lent article on the miniature art of Nature and Science Suggestions are made for observing Halley s comet. Dr H A Gins writes on the optical method of studying immunity to bacterial disease. Many of cur readers have no doubt wondered how an ex can really prove that he reached the Pole, it orer view of the recent Copenhagen declain. The method of examining an explorer's notes and ascortaining whether or not be reached the Pole is excellently presented by Professor J Hammon Smith

### Carrennandence.

#### WHY BAND SAWS BREAK

To the Editor of the Scientific American Mr R Miner of Lumberton, Miss, has insert mr it miner of cumpercon, mass, has mested an article in your valuable paper, the Stavrnic Auraica to of November 19th, 1909 conterning the causes of breaking of springs. He also relates the breaking of bendsaxs, which is a very important point to overcome, as it is a well-known fact to all who use bandsaws that a saw after running a few hours becomes longer in the back edge on account of the back pres-sure from the saw guide which gradually brings the m more and more toward the teeth or sawing odge

If any little cracks exist by reason of improper fin tabing they will certainly increase and the flaw will break. If the manufacturers of bandsaws would study this matter they would soon find out that the fault lies in the carriess way of making the steel and preparing it for a saw

Manufacturers who have won reputations for mak

ing bandsaws in smaller sizes as from % inch to % inch, are looking for too great a profit and forget to make use of the same skill exerted in making handsaws for exhibition

Hy an average approximate estimate a % inch band-Hy an average approximate estimate a % inch nan-saw will not run long chough to wear for one-half dozen filings before it is broken in so many places that it is impossible to make any more use of it. Chicago

# A CURIOUS PHENOMENON.

To the Editor of the Scientific American While driving along the shore of Canandaigus Lake, in the State of New York, on Tuesday, January 4th, I observed a curious natural phenomenon

The temperature of the air was six degrees above zero, a light northwest wind blowing and the bright sun of the afternoon occasionally obscured by the pres-ence of large and low hanging cumulus clouds.

The surface of the lake was covered by vapor caused by the difference in temperature between the cold atr and the comparatively warm water. This vapor visi-ble in the form of a slowly rising, done, white must gathered in spots in masses rising higher than the surrounding mist. As these masses of vapor reached a height of some twenty feet they appeared to take on awagnt or some twenty rest they appeared to take a rotary motion and formed themselves into columns slowly rising until their apease met the lowlying clouds, where they spread out in a funnel shape exactly as do water spouts. The columns warded from a early as do water spouts. The columns warded from a sconding in a straight line and others bent into fan ascending in a straight line and others bent into fan tastic curves by the action of the wind I saw a great number of these mist whiris during a drive of some two hours, covering a distance of ten miles along the lake shore, and as they formed and drifted slowly across the water illuminated by the rays of the set ting sun, they were a beautiful and to me a unique spectacle

Can you tell me if similar phenomena are often observed? JAMES S. LAR.

Speaking before the Royal Society in London on the subject of magnetic storms Mr E W Maunder super intendent of the Solar Department of the Royal Ob-servatory, Greenwich said that magnetic disturbances were in some way connected with the rotation of the sun upon its axis. It was clear that, besides sending sun upon its axis sun upon its axis. It was clear that, besides sending us light and beat the aun sent some kind of influence which came only from certain portions of the surface and came along closely restricted lines. They found there was a tendency for magnetic disturbances to take place when a sun spot had got to a definite portion on the sun's disk. If they took, it has the instructed had came from the sun and struck the earthtion on the sun's disk If they took it that the indu-ence that came from the sun and struck the earth came from the center of the sun spot, they would be able to calculate how long it had taken place, and, assuming that, they found it would take about twenty six hours to come from the sun, a distance of \$3,000. 000 miles, to the earth



# A GREAT OPEN-AIR TELESCOPE

BY PROF. S. A. MITCHELL COLUMBIA UNIVERSITY



A giant telescope has been erected in Germany having for its main purpose the making of astronomy popular through whilitions to the public of the heav The United States has repeatedly fol lowed Germany in her advances along scientific lin and here would be a splendid opportunity to emulate her by the creation of a great public telescope (say) in New York city

A contrast of this new German telescope at Trep-tow (mar Berlin) with the highest development of American manufacture proves of the greatest interest in the Yerkes telescope (see Scientific American De cember 25th 1909) we have a great instrument given cember 20th 1999) we have a great instrument given over to vast research, handled by a corps of expert astronomers leaders in their special lines of work Prof E E Barnard is there with his keen eye for the necasurement of the positions of comuts, star (insters, etc., for the depicting of slight planetary details, or with the help of the photographic plate for the hor trayal of Mars on a large scale. The greatest living authority on double stars Prof S W Burnham spends two nights cach work with the great 40 lach refractor The director, Prof E B Frost, takes care of the spec trescopic side of astronomy by photographing the tra of stars for the determining of their motions in the line of sight and by day time the telescope is made use of to learn of interesting phe-

nomena about the sun. This gre-telescope is a model of engineering This great perfection with its great tube and massive parts rising floor and ro-tating dome it is mounted in what is known as the equatorial

But how different is the Trentow telescope' Erected with other pur-poses in view, it is not necessary to poses in the it is not necessary to have expert scientists to keep the telescope employed almost every hour during the day and night constructed under a different plan constructed under a different plan its unnecessary to have a great elevating floor inside of a huge rotating dome, for in fact the dome is dome away with and the tele scope is used in the open air? This then brings something radically new in the old seture of astron omy, something entirely different in the construction of a great tele-scope. And this new form of in strument has many points in its favor that make it a most interest ing telescope.

The director of the Treutow Ob vatory, Dr F S Archenhold, by

his radical ideas came into opposition with the Ger scientists who ridiculed the idea of placing in the open air with no protection from the wind a great tube 68 5/10 feet in length seven feet longer than the Yerkes telescope (62 feet) But undaunted, Dr Arch enhold persevered and finally succeeded in collecting sufficient funds for the erection of the intgest tele-scope in the world. And this, too in scientific Ger

Any'
The front page illustration shows the Troptow telecope. The old equatorial form of mounting was dearted from, for this requires that the eye and of the scope. The old equatorial form of mounting was de-parted from, for this requires that the eye-end of the telescope be raised through a vertical distance ap-proximativ just fit he length of the telescope tube in vicaling a star overhead and one near the horizon. This necessition of very expensive clearting foor run by electric motors (No events Assaura, December 10.1, 1986 by senting the telescope tube in a great child was falle to have the eye-piece may be accepted exhed was falle to have the eye-piece may be a sent to exper-dendly was falle to have the eye-piece may be a sent to experceasing was sain or in the telescope tube upward into the air. The details of this will be readily seen by referring to the lituariation. This climinated the ris-ing floor and saved many thousands of dollars. The low forked mounting with its heavy movable parts placed on a solid concrete foundation insured a stable instrument and as the whole construction had no

great height it became possible to house the telesco b) turning the long telescope tube into a horizontal position and pulling over it a cheap portable house By using the telescope in the open air it became possible to entirely eliminate the great dome, and thereby save again more thousands of dollars. The result of these plans were that Dr Archenhold was able to build the completed instrument for the modest sum of \$62,50 Of this sum \$11,500 was spent for the kin, which was made of the celebrated Jens glass ground by the cid-established firm of Steinhiel, in Munich The lens is 27 inches in diameter, and is an excellent one

The radical separatre from old-established forms in tilminating the dome has many points in its favor builded the mere saving of money, and size many drawbacks As is well known to astronomers, the temperature of the night air is continually failing (especially in the early part of the night), and it is impossible to have the air in the interior of the dome imposition to have the six in tas interior or for dome at the same temperature as the outside six. This causes the heated air to pour out through the all of the dome, and also produces currents of air in the interior of the telescope tube itself. All of this makes "bad seeing," and a distortion of the telescopic imagethe bane of the existence of the professional astronome

it is necessary to drive the telescope to make it more from east to west, otherwise owing to the earth's rota-tion the object would quickly more from the field of the telescope in the Traytow (elescope both observer and instrument must be moved, and the details of how this is done by a % horse-power motor regulated by the leader of the control of the control of the control of the seen in the smaller illustration.

The Cost of Our Navy.

IT CONTS A GOOD DEAL OF MONEY TO RUN A NAPY The actual expense of running the navy of the Unit States for the past fiscal year a cunted to \$43,790,000 in this sum is included everything, from the pay of enlisted men to the repairs and equippage of vessels.

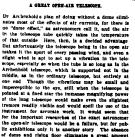
And the vessels include the tugs and receiving ships as well as the battleships.

The battleship "Connecticut," flagship of the Atlan c fleet, may be taken as an example of the cost of keeping a vessel of that type in service The pay of officers and enlisted men attached to this vessel with the other expenses amounted to more than \$790,000 during the fiscal year just passed. The Atlantic fleet in that period included sixteen first-class war vessels vis., six of the "Connecticut" type, five of the "Georgia" class, and the others ranging from 13,000 tons to 11,500 tons. The average cost of keeping a vessel of the "Georgia" class in commission, not

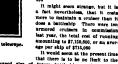
including repairs, is \$677,500 a year The classes below the "Geo quire expenditures ranging from \$532,000 to \$604,000 While the fig. ures will vary for the same vessels in different years, the cost changes vary little from year to year for the same class \$10.521,000 was the total cost for running the sixteen ships of the Atlantic fleet for the past year There were twenty three first-class battleships in com mission last year, and the total cost of keeping them in service exclusive of repairs, was \$13,035,000, making an average cost for running them \$592,084 On all these ships the repairs amounted to only \$100,

It might soem strange, but it is a fact nevertheless, that it costs more to maintain a cruiser than it does a battleship There were tea armored cruisers in commission

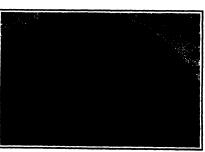
It would soon at the present time that there is to be no limit to the intermediate of the time to the intermediate of the time to the intermediate of remains appeared for remains appeared for intermediate. For instance, we have a subject to the intermediate of remains appeared for commission, the "Michigan discharged for the Corollar," and Corollar, and the control of the Corollar, and the control of the Corollar, and the



of that cultiles steep, then, is a decided assumings. Dut unfortunately the telescope being in the open air makes it the sport of overy passing wind, and even a slight wind is apt to set up a vibration in the telescope, expectally so when the tube is so long as in the Archenhold telescope, which is supported not in the middle, as in the ordinary telescope, but entirely at one end Though the vibrations may be small and one end Though the vibrations may be small and imperceptible to the eye, still when the telescope is pointed at a fixed star the immense magnifying power of the long tolescope would make even the slightest tremors readily visible and would spoil the use of the fromors readily visible and would spott the use or tan distriment. For accurate work, It would seem that for the important researches of the exact astronomer the operafir elsectope would be a failure, but for pub-lic exhibitions only it is another story. The absence of dome and rising foor elisionstee a great amount of the expense, and the modest amount of the popular of the expense, and the modest amount of the popular subscriptions can be all put it also the construction of of the expense, and the modest amount of the popular subscriptions can be all put into the construction or a telescope thus obtaining a much larger instrument. The telescope is raised and a star located by means of a 54,-horse-power electric motor: it order to keep of a \$14-horse-power electric motor. In or the telescope pointed correctly at the cele



The Philadelphia Rapid Transit Company reports that on certain of its lines in that city stone the intendention of paya-prometer; stront care, the support of accidents to persons has decreased it per cent. This remarkable change is authorized to the aprangement of closed foort and stops, making it impossible for parangers of one or of the ones now accident.



Yiew taken under the mounting, showing the electric motors for driving the telescope.

# **AMERICA'S FIRST AVIATION MEET AT LOS ANGELES**

## DETAILED ACCOUNT OF THE FLIGHTS MADE BY THE AMERICAN AND FRENCH AVIATORS

The first aviation meeting to be beid in this country opened at Los Angeles, Cal, on the 10th instant. Louis Paulhans, the record-breaking French aviator, was present with two Farman biplanes and two Bierlot monoplanes. America was represented by Glenn Curtias, C. F. Willard, and C. K. Hamilton, all of whom flew curtiss bibliancs. The field that served as an aerocurtiss bibliancs. The field that served as an aerodrome was located a few miles from Los Angeles. It was not a lides liplace for flying since it was not level, One end of the field was at a considerably higher elevation than the other and the machines were, therefore, obliged to five quite high in order to pursue a level course A hexagonal course of 1 til miles was used Only a few short lightly sever made by Means

Curtims and Willard the first day Messra Beachy and Knabenshue, in their dirigible balloons, few 200 fort above the grand stand against a which of 10 to 12 miles an hour Paulhan made his initial flight of 8's minutes at this time, covering an estimated distance of 4% miles In the second flight he remained aloft 10 minutes. Ills third flight lasted 29 minutes is



The two Farman biplanes flying in front of the grand stand.

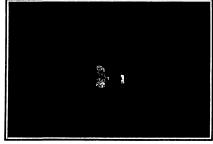
The Knabenshue and Bosoky dirigibles are reen at the right

Chas. F. Willard flying in the Curties biplane of the Aeronautic Society.

Mr Willard won the prise for slighting upon a square having 85-tool sides.



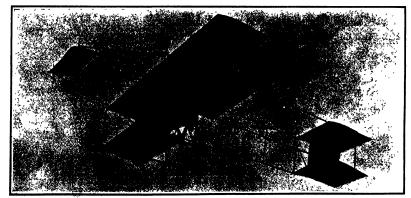
Mme, and Mons. Louis Paulhan.
The daring French aviator and his wife hold
the wound for consequently fixing



The Bieriot menoplane in flight as seen from a baileon.



Three two views of the Bloriot monoplane give a good idea of its equally bird like appearance when view of from above to below that him without difficulty, but his inox perionsed satisfants met with accelerate and broke both too hince.



Completed 4 District.

Parlina making his recept-breaking high-flight in the Farman hiplane. He reached an official height of 4,105 feet

Blue mentage is the sport largered type of highest produced shaped. A signite vertical rather in one fitted interest the markets of the tail in place of the twin rathers and the rather in the state of the twin relative. The histories was a significant of the relative flow in the production. The histories was a significant of the relative flow in the first production. The histories was a significant of the relative flow in the first production of the production and the production of the production of

sides dashing at the grand stand and just clearing the heads of the spectators, he flew out of sight over the neighboring ranches

On the second day the first flights were made by Paulhan, who took out his new Farman biplane and drove it thrice around the course in a stiff wind, said to be of 18 miles an hour velocity, which was blowing from the ses. Now to for variety he mounted one of the tiny Bleriot monoplanes, with which Miscarol had been attempting to get off the ground—lie had no difficulty in flying it in the wind that was blowing. Although it bobbed up and down and was tossed about like a small boat on an augry wa Paulhan flew about the field and several times swept past the grand stand, perfort various maneuvers and rising to an estimated beight The speciators gave a sigh of relief when he finally landed across the field from the stand was soon out aga'n with his Farman biplane, in which be quickly disappeared from view far to the north Shortly after he reappeated over the trees of a nearby ranch, and frequently charged at the grand stand, turning aside just in time to clear the speciators or cise to sweep over their heads. This flight of about NE miles lasted 21 minutes and 12 seconds. It was the fourth flight he had made on the second day of the mostling. After Paulhan's flights, Mr. Curtiss brought out his Rheims racer, which is fitted with an S-cylinder unter-cooled motor of 50 horse-power Mr Fancuilli ed on board with Mr Curtiss, and the machine shot into the air for its speed test with a passenger After describing a wide circle in front of the grand atted (urise few around the course at a speed fig ured out by Lieut Paul Beck, of the Army Signal Corps—one of the judges—at over forty miles an hour Paulban immediately started a flight. At the same time Messrs Willard and Hamilton started on their Curtiss biplanes in front of the grand stand Curtiss followed them a few moments after with Mr

Clifford Harmon as a passenger All four machines were flying at the same time a spectacle well worth seeing Paulasn landed a worth seeing Paulian landed a few minutes later, took on one of his mechanics as a passenger and twice circled the course as readily as he had done alone

Curties established a new start ing record and also a record for landing but Willard beat Curtises in the latter respect. Curtiss start ed from a marked square of 400 square feeet flew once around the aquare feeet flew once around the field in something over two min utes and landed exactly on fine aquare from which he started. He by getting off the ground in 62/7 is after a run of but 98 f Paulhan required 13% seconds time and a run of over 100 feet

The great event of the third day was Paulhan's successful attempt at breaking the world's record for altitude The existing record had

een made only six days before by Hubert Latham at Deen made only six days neutro by require taxinan as Mourmelon, France, with his Antoinett monoplane, and was 3,444 feet. Paulhan started in front of the grand stand, and heading north, he went steadily upward in circles until he was nearly a mile high Bo high did he fly that to the eyes of the oulookers the machine appeared the merest speck in the sky After ascending some 46 minutes, he pointed his bi plane once more toward the carth, and came down at a much greater angle and in about one-sixth the time minutes) The registering barometer on his ma registered 1525 meters or just over 5,000 feet, (7% minutes) so that Paulhan had apparently beaten Latham's rec ord by some 1500 feet. He was given a great ovation upon landing. The total length of the flight was 53 minutes 461/5 seconds. Paulhana helght, as mea-ured from the ground, was officially determined at 4.165 feet.

The fourth day Paulhan gave a good demonstration The fourth cay rauman gave a good nemonstration of the weight-carrying ability of this new Farman ma-chine which is much smaller and weight 226 pounds less than the regular Farman biplanes, by taking up his two assistants Maisson and Miscarol, and circling neveral times around the course with them. Curtiss circled the course ten times in 24 minutes 54 2/5 seconds. Paulhan tried to beat this time and failed by onds. Paulban tried to best this time and failed by five seconds only Previously, he made three laps in 5 18 1/6 carrying his wife as a passenger After circling the field to alighted readily in the marked-off square from which he started In another fight of minutes' duration he carried Very Ferris as a passenger. He again reworted to his sensational methods, friging low over the grand stand, making sharp turns, etc. Hamilton, Paulban, Curries and Willard qualified in three-lap sights for all oversats. The first name ded in three-lap sights for all oversats. The first name made a flight with his vertical rudder locked, in order to show that this rudder does not have to be used in connection with the balancing planes, as is done by

the Wright brothers when they warp the planes of their machine to correct its transverse equilibrium. This combined operation of the equilibrium-maintaining device with the vertical rud strongest claims in the Wright patent. Where pla strongest claims in the Wright patest. were pames warping is employed, it is necessary, in order to pre-vent the slewing around of the machine, when the plane is warped to a greater angle. With balancing planes like those used by Curtiss, the resistance inserted at one end of the machine is as great as at the other, the consequence being that the vertical rudder does not necessarily have to be used. This flight with the rudder fastened demonstrated very well the difference between the two systems. Mr Willard again flew once around the course and landed in a measured once around the course and landed in a measured square, thereby winning a prize of \$250 Paulhan was presented with a \$500 silver cup by onthusiastic citi presented with a 8000 suver cup by ontinumstate cut: sens of San Diego. The next day he made a cross-country flight of some 16 miles to San Pedro and back, circling above the revenue cutters in the harbor and being greeted with cheers by the inhabitants. Paulhad also made 6 circuits of the course with his assist ant in 1814 minutes, and afterward flew twice around ant in 18th minutes, and atterware new twice around it alone in the Bierlot monoplane. His fastest hap in the latter machine was done in 2 43, which equals a speed of 341 miles an hore. Curtiss made the fast cat lap of the course in 2 12—a speed of 43 45 miles per hour. Subsequent to a race with Beachy, Knabonshue made a lap in his dirigible in 5-10 2/5—a rate of 18 4 miles per hour Hamilton tried for the slow lap prize and succeeded in making one circuit of the course in 3 362/5- a speed of 26 78 miles an hour The time of Willard's slowest lap was 3 11 1/5 Hamilton made ute flight for altitude, reaching a height of

But very little flying was done on the sixth day of the meeting, owing to wind and rain. The field was wet and inuddy, but notwithstanding this, all the ayi-



Prof. J. S. Zerbe's multiplane. This machine is of the following plane type.

A NOVEL AMERICAN ARROPLANE AT THE LOS ANGELES MENT

ators got off the ground without much difficulty and made a few short flights. Paulhan attempted to Curtiss' ten lap record, but he was unsuccessful lard and Hamilton also made an attempt at this y ord, the latter covering the 161 miles in 30 34 3/5 or at an average speed of 317 miles an hour Mis-carol, Paulhan's assistant, made a brief exhibition flight with a Bieriot monoplane In landing, the manight with a signific monoplane in landing, the ma-chine thipsed to one side, causing the wing to strike the ground and break off. The accident was blamed upon the substitution for wing warping of the movable ends of the tall, which normally move together and act as the forizontal rudder By moving these ends of the tail in opposite directions, the transverse equilibrium can be maintained fairly well under ordinary conditions, although this method is not so positive as that of warping the wings themselves.

nday January 16th, but few flights were : the weather still remained inclement. The following the weather still remained incisement. The following day, however, Paulian attempted to byeak Farman's record of 4 hours and 17 minutes. After remaining a slot 1 hour, 56 minutes, 97,875 seconds, during which time he covered 166 miles, Paulians was oblighed to desend on account of a leak it the gasoline tank. He therefore did not come within 1% hours of equaling Farman's record. Hamilton also Sew during some of the time that Paulian was making his cardermane flight. He kept at a lower level and made 11 circuits of the course, but was obliged to stop on account of motor trouble Curties lowered his time for ten laps to 28 minutes, 43 2/5 seconds (49.71 miles an b His fastest lap was three seconds slower than his best previous circuit. Paulian covered ten laps in 25 51/6.

Beachy made one lap in his dirigible in 4:57 4/6 (1946 miles an hour). This was the fastest lap second by any dirigible during the meet. "The Gill-Dosch biplans, which is very much like the Cur-lisa, and which was constructed by two scattleness

from Baltimore, Met., made several intempts to sak off the ground, both was only successful in sanking a few short jumps. Mr. Clifford Harmon made a short dispit alone in his new Currier meables. These the successful and Truesday, January 13th, is hoteworthy for the long cross-country flight of Monz. Fusilizat, who flew to "Justicy Baltiwith vanction and beat, a distance of short

"Landy "Baldwis" ranch and back, a distance of showt I'dly miles, in bour; a minutes, 4847 seconds. In the course of this flight he rose to a height of 2,139 few. according to the regularing baronster carried in the biplane. Most of the time he was at a height of between 1,000 and 2,000 feet. During the returns [our-ner, which was made in about 23 minutes, Pauliana And to fight against a rather strong westerly which and yet he is said to have required only about three minutes more securities that he was the said to have required only about three minutes more securities that he was the said to have required only about three minutes more securities that he can be said to have required only about three minutes more securities that he can be said to have required only about three minutes more securities that he can be said to have required only about three minutes are securities that he can be said to have required only about three minutes are securities. utes more returning than he consumed in flying to the ranch Probably at the elevation at which he was traveling he did not encounter as strong a wind as was blowing near the earth.

January 19th was given up to the making of a mun January 19th was given up to the making or a num-bor of flights with passengers. The weather was per-fect save for a puffy wind in the early afternoon, which later died out altegether About 2:80 Pi M Paulhan started on a cross-country flight with his wife rauman starteger as a cross-conntry night with his wire as a passenger After civing once around the field he left the course and headed directly toward the ocean. He flew at a height of some 500 feet to Re-dondo Beach in the course of his flight he passed over several other neighboring measide resorts. He re-turned safely after 23% minutes, having covered over 20 miles across country without difficulty This flight was twice as long as that made by Orville Wright at Fort Meyer last summer in the speed test for the go ernment It is the longest cross-country flight ev made with a passenger, although it was not by any means as hazardous as the one made by Mr Wright. means as hazardous as the one made by Mr Wright.
Other flights were made with Mrs. C F Bishop, Lieut. Paul Beck, W R. Hearst, and a reporter for a New

· York newspaper For the second time Lieut Beck tried dropping dummy bombs upon a measured square on the ground While he did not succeed in hitting the mark, he came very close to it, and showed the possibility of dynamiting a warship or a town in this way Paulhan's last flight was way Paulhan's last flight was made with Mr Harmon as a pen-It was a cross-c flight of 8 to 10 miles lasting about mignt on a ... Hamilton made torse 20 minutes. Hamilton made torse attempts at high flying, rising to heights of 455, 300, and 700 feet, respectively The Gill Deach bit of the and respectively The Gill Dosch bi-plane was finally made to fly and was driven once around the field by Hillary Boschy In descending, however, it was badly damaged Curtiss made two laps, but was un ful in breaking his speed pecond

The last day of the meet, January 20th, Curties made the longest flight he has ever accor

Starting at 3.25 P M. Paulhan had made but two or three laps, when Curtiss went aloft about half a lap behind him Mounted on his Rheims racer Curtisis steadily gained upon Paulhau, and after making three laps passed him in front of the grand stand, his small biplane flying directly above the larger French ma-chine. This was the first real race the spectators had values. In a was users real rock in spectrum and witnessed, and Curtiss received great applause He continued to fiv around the course until he had cov-ered 30 laps (48 3 miles), his time being 1 is 39 Paulhan made 38 circuits of the course (68.5 miles) in 1 34 34 The average speeds of Curtiss and Paulin 14:44 The average speeds of Curties and Pauls aver respectively 37 at and 377 miles and Pauls Hamilton made a flight to Monesa, about 7 miles from the aviation Sidd. He rose to a height of swell hundred feet and disappeared from view upon the borizon. Upon his return the enablash of his motor-broke when he was nearly back, and he succeeded in glitting down to the field and alighting without mishap. A feature of the last day was a parade showing he avoid to 10 concention. The plands opened with an old-time "prairie schonner" and ended with the seroplanes.

## The Boston Acromatile th

The Session Accessants there. The first Associated Shows. The first Associated Show to be held in America as a separate affair will open in the Mechanica Bullen, Boston, Mass., the evantum of Pebraury 1884. This show will be held under the ampiece of the Asro Cheb of New Bagland, and a stumber of hyes well known in this sectionatical world stand spontoner for L. Bedding annerous mobiles of aeroplanus, there will be exhibited a number of Indicated representative mechanics. A subjection of the Defined State government's colorest of the State of th

## Scientific American



TOOL FOR GUTTING STAY BOLTS.

Stay belts in locomtive boilers usually bree the inner side of the outside boiler sheet. W broken bott is in position behind the frame of the leco motive it is necessary to drill the bott on the firebox and drop it out of the way, after which a hole is bored



TOOL FOR CUTTING STAY BOLTS.

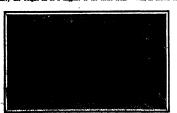
through the ginh in the optside sheet and the part of the bolt remaining is cut out with a round nose chisel.

This is difficult to do, and it sometimes happens that cet is grooved in the operation, and trouble is thereby With a view to overcoming this diffi caused thereby caused thereby with a view to overcoming this cities cally the tool illustrated in the acrompanying engraving has been invanted. It consists of a cutting member arranged to move in a sheath which can be fitted into the hole drilled in the bolt and serve as a guide not to acte or which is then operated to cut out the bolt. The body of the tool, which is of hexagonal form, is indicated at A Projecting from the body A is a blade B formed with a boad C at its lower edge. The sheath above referred to is indicated at D and rmed with a central bore to fit the bead C and s slot to receive the flat portion of the blade as indicated in Fig. 2. The sheath D is reduced at E to form a centering guide. The boit to be removed is form a centering guide. The boil to be removed in first drilled out, as indicated in Figs 3 and 4, to the diameter of the part B of the sheath. The portion B is then fitted into the bors, after which the outting tool is operated to drive the end F of the blade into the bott and cut it out as indicated in Fig 1. After the boil has been cut at three or four points it may easily be knotched out. Mr William Simits of Peaksuity be knotched out. Mr William Simits of Peaksuit of Pe tigo, Wis., has secured a patent on this new cutting

## UTILIBING CENTRIFUGAL FORCE PRACTICALLY

A Danish engineer, resident in New York city, Dr Albert C Albertson, has endeavored to turn to prace Albert C Alcoration, an encoavoree to turn to pre-tical use the enormous centrifugal force generated by a rotating body. His invention is at present embod-ied in an actually constructed and operative air com-pressor, with what success we leave our readors to judge from the accompanying illustration and the fol-lowing brief description.

In each of two parallel guide frames a block is ounted to reciprocate Each block is connected w meanined to reciprocate Exact nince is connected with the plates roke of a duplet compressor. Through the blocks an axie runs to the end of which is attached a weight-carrying arm. When the arms are thrown foreiby to one side or the other, each block moves back and forth, because the centrifugal force produced at the weighted end of the arms is endeavoring to carry the weight off at a tangent to the circle from



CONTRIBUTAL MARRIED 

its own center. But the center of each circle is the axle in the respective block. Hence the blocks move outward in their guide frames as the arms are thrown out. The angle bearings, center, arm weight are all therefore constantly changing position so long as the arm is being turned fast enough Each centrifugal arm in its flight does not describe a circle, but rather

ellipsoidal curve due to the shifting of the block an empeodal curve use to the suntaing of the broad.

The two guide frames, as has been stated, are placed parallel to each other, each having a block, arm, weight, etc. The blocks are held in opposite positions so that the arms will balance each other and so that the two blocks will always reciprocate in opposite directions

The means employed to hold the centrifugal arms in position, and yet allow them to follow their respec-tive "pulls," consists of a shaft between the guide frames with two crank arms, each of which has a pin extending into a slot cut in each arm. The crank shaft is driven by a small motor As the cranks turn, the contribugal arms are turned by the pins which project in the arm-slots. The greater the speed of the crank, the greater the power of the centrifugal arms Because there is no connection between the centrifugal arms and the cranks, the reciprocating action of the blocks is caused entirely by centrifugal force

It is a curious though easily comprehensible fact the amount of centrifugal force developed was so great in the machine illustrated that it was necessary to cut away part of the material of each arm and to reduce the weight so that the pistons would not ham-mer against the cylinder heads.

BRACE FOR BRICK KILFS.

During the process of baking bricks the kilns expand and contract, and if the sides are not braced after they have contracted they are apt to toppie over if the kiln should expand again. Hitherto it has been the custom to brace the sides of a kiln with tim bers and wedges which work involves considerable



BRACE FOR BRICK KILWS.

danger to the workmen while adjusting the wodges In order to remove this danger an inventor has rece iy davised the brace illustrated in the accompanying engraving It consists of a bar A formed with teeth along its upper edge One end of the bar is provided along its upper edge. One end of the bar is provided with a pair of studs adapted to engage a curved slot B in a supporting member O. The base of the support-ing member is made broad so as to provide a large bearing surface. The bar A enters a recess in the supporting member and is cut away at D so that when the supporting member is pressed against the kiln the upper edge of the base will dig into the wall, as shown in one of the illustrations. The tooth on the bar A are adapted to be en

gaged by a pawl S which is ful crumed in a member F that is supported on a timber disposed along the side of the kiln. The member F is held in place by teeth
G, which dig into the wood The pawl K is provided with a thumb plece H by which it may be lifted out of engagement with the ratchet teeth in the bar In using this brace the workman thrusts the supporting member C against the side of the kiln and places the member F in position on the tim-ber Then pressing against the kin with his foot he takes up the black between the two members C and F by engagement of the pawi S with the ratchet teeth on

the bar A. Mr Anatole Ferusse (care of J McLess 345 East Strand, Rondout, N Y ) has just received patent on this improved brace for brick kilns.

### BUTCHERP SCALE PAR.

It is customary for butchers to weigh meat in large scale pans that are usually provided with a rigid ball which is also of large dimensions, and the fact that the bail is rigidly attached to the pan makes it inconveni-The ent to slow away the pan when it is not in use accompanying engraving illustrates an improved form of butcher's scale pan in which the bail is so mounted that it may be fold ed down against the pan when it is

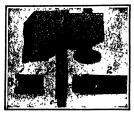


BUTCHERS SCALE PAR WITH FOLDING BAIL

not in use, but whenever desired may be locked rigidly in an upright position The ball is not directly con neeted with the pan, but to a pair of rails which serve to distribute the strain in our illustration we have lettered the pan proper A. Riveted to the pan at the bottom are a pair of diametrically disposed straps B which cross each other at right angles and are bent up at the ends against the sides of the pan rails C which are curved to conform approximately to the shape of the pan are secured to the ends of the Hinged to these rails is the bail B which is bars R provided with the usual book for attaching it to the scales. One of the rails U is formed with an outwardly projecting finings E in which is a square aperturadapted to receive a finger F that is free to slide  $\alpha$ magnetic review a major s that is free to state an the bail D. When the finger F is fitted into this aper ture the ball is held rigidly in upright position. On lifting up the finger F the ball is reveased and may be folded to the position indicated by dotted lines in the engraving Mr Jacob Feldman of 70 Carlton Avenue, Brooklyn, N Y, has recently secured a patent on this improved scale pan

### DOOR SECURER

A very convenient device for securely locking doors has recently been invented which should be of par-ticular value to traveling men who often find it necessary to occupy a bedroom not fitted with an efficient lock. The locking device may readily be applied to any door without marring it in the least. As shown in our illustration, it consists of two plates. larger plate A is provided with teeth which The placed against the jamb of the door and when the door placed against the jamb of the acoor and when the door is closed on the plate it forces these teeth into the wood. The opposite end of the plate A is turned back upon itself to form a hearing C the purpose of which will presently be explained A square opening D is cut through the body of the plate A and adjacent this opening a cam or occuntrically mounted disk E is provided The second plate, as shown in Fig 3, is formed with bearings F adapted to fit at opposite sides of the bearing C and receive a screw that passes through the bearings of both plates, being threaded into one of the bearings F. The smaller plate is also provided with a lug O which projects through the open



SIMPLE DEVICE FOR SECURISE DOORS.

ing D in the plate A. The lug G is recessed to receive the cam E, and the latter is turned to press the step Hagainst the door and thus lock it shut. In order to allow for the movement of the smaller plate as the cam N is turned the bearing C of the larger plate is clongated as shown in the drawing. The inventor of this door securer is Mr Charles W Lent of Tingley,

#### AW OIL CAN

The oil can illustrated in the accompanying engrav ing belongs to the class embodying a figible bottom which is operable to cause a flow of oil The construc-tion here shown, however, is arranged to provide a considerably greater flow of oil than is obtainable in sourced by providing three disphragms in the can, one of which serves as the bottom of the can, while the other two are connected at the center by a nipple Ir this manner an oil chamber separate from the main portion of the can is formed in the accompanying engraving the can is shown at A with the usual nozzle B threaded into the upper end Fitted into the lower end of the can is a retaining ring C which has er ing flanges at the upper and lower ends and is also but outwardly at the lower end to fit against a shoulder formed in the can body. The dished dis shoulder formed in the can body. The among an applicaging I and E bear against the flanges of the retaining ring. The two disphragms I and E are connected at the center by the nipple I. The disphragms or bot tom F is soldered fast to the can body. An oil chamber is thus formed between disphragms F and E. In operation when the bottom of the can is press ward it drives the oil from the oil chamber with greater pressure than would be the case if the entire can body formed a single oil vessel. At the same time



TRIPLE-BOTTOMED OIL CAN.

the other two disphragms yield as well, thus effecting a large discharge of oil Mr Frederick G Svetilk of Cadott, Wis , has recently secured a patent on this improved off can

### AUTOMATIC WASON BRAKE

Two patents have recently been issued on the sub ject of wagon brakes, describing a form of brake for use on carriages and wagons, that will be automatically applied when the horse is checked or presses back against the load when going down hill. The brake may also be applied by hand and can be thrown orace may also appared up and and can be chosened to back the vehicle. In order to take off the strain upon the mechanism when traveling around curves or over rough roads, a fiexible connection is made between the tongue and the brake mechanism. In Fig. 1 the tongue cated at A It is provided with a crowned roller B mounted on a vertical axis which bears against a crown roller C mounted on a horizontal axis. Th roller C is carried between two arms of a brake reach D which are disposed at each side of the main reach E and are free to slide longitudinally in the hounds. The brake reach D is connected at the rear end to a lever F which is connected by chains to the brake beam G. The intter carries the brake shoes that bear against the rear wheels of the vehicle The brake beam is connect rear wheels of the ventue The brake beam is connected by a spring to a post H carried by the main reach E It will be evident that when the tongue is pressed backward or when the vehicle rides forward on the tongue the brake reach will throw the lever F back ward, drawing the brake shors into engagement with the rear wheels. A hand lever extends upward from the rear wheels. A hand lever extend upward from the lever F to permit of operating the brakes manu-ally in order to throw the automatic mechanism out of operation the tongue A is locked to the hounds by means of a simple mechanism. It consists of a lever

I with a downwardly projecting flange adapted to en-gage a flanged piece J carried by the tongue. The lever I is mounted in brackets secured to the hounds lever I is mounted in brackets secured to the sounces and is normally spring-pressed out of engagement with the piece J A cord running from the lever I to within convenient reach of the driver may be drawn within convenient reach of the cirver may be drawn upward to throw the lever I, whereupon a latch K will engage a stop piece sorving to hold the lever in sot position With the tresspice J set as shown in Fig 1 it is possible to lock the brakes against the



AUTOMATIC WASON BRAND

wheels, while if the piece J is set with the fiange at the opposite side, as shown in Fig. 2, it serves merely to lock the tongue to the hounds in such position that it cannot set the brakes.

The second construction referred to is similar to that shown in Fig. 1, and corresponding parts are re-ferred to by the same, but lower-case, letters. The tangue a is connected to the brake reach d by means of a chain b which passes over a pulley? The brake reach d is connected to a lever f which in turn is connected by means of chains to the brake beam g. The brake beam is connected by a link to the main reach e, and is held in inoperative position by a spring attached to the brake reach d. The hand lever for operating the brake is shown at h. A locking device similar to that shown in Fig. 2 is indicated in Fig 4 compr a lever i mounted on the bounds, a lug j mounted on the tongue and a latch k. The inventor of these wagon brakes is Mr. Ebon G. Dolan of Starksboro, Vt.

### ODDITIES IN INVENTIONS

Імевочко Вног Втактенка trated herewith is so arranged that it may be adjusted for stretching shoes of different sizes and shapes, and for applying the

shoes to a com-fortable fit. The

stretcher is pro vided with a sta

per end, which terminates in a



tionary base, formed with an IMPROVED SECR STRETCHER. knob. Fulerum

is a bell-crank lever, one arm of which is also provided is a beli-crank lever, one arm of whith is also provides with a knoh, mating that of the Kned arm. By depressing the beli-crank lever, the knobs will be forced apart, stretching the shoe at the points of contact. These knobs are removalles, and are provided at one icle rounded and the other projecting Each knob size has a square tappered opening adapted to fit the arms of the shoes stretcher. The knobs may readily be and the shoes are contacted to the shoes stretcher. The knobs may readily be and the shoes stretcher. The knobs may readily be and the shoes stretcher. plied, either with the projecting portion bearing against the shoe, or with the rounded portion, as de-

ventor has recen ly procured a pat-ent on a device rocking for chairs, without placing the feet on the floor The particular advantage of this scheme is that a slight movement of the feet will of the reet was cause the chair to rock. Fulcrumed to the rockers are a pair of levers



fitted with reflers at one end to engage the floor, at the opposite end connected by means of links to a pair of bell-crank levers forming a sort of a treadle. a pair or conservant system turning a sort or a treatment on which the operator's fact are supported. By press-ing this treadle downward, pressure will be brought to bear on the rollers, causing the chair to rock. When desired, the mechanism may be thrown out of opera-

tion by folding the treadle up against one of the

pieces of the chair

Boctaring Orisanal Rugs,
Of the hundreds of thousands of dollars worth of
Oriental rugs brought into the United States anneally,
many of them are what is known to the profession
as "wander rugs." This means that brightly conforOriental rugs are sometimes washed with a solution
of chloride of lithe, a treatment which partly bleaches
the colors and imparts a soft appearance to the rug. the colors and imparts a soft appearance to the rag. The chemical treatment is a precess of washing which produces the effect of age and a peculiar sheen to the surface, which is pointed out by many dealers as a proof of superior quality. The fact is, however, that the process of washing invariably weakens and in some instances destroys the materials of the rag. The progressive refer to of the chemical treatment of the progressive refer to of the chemical treatment of the progressive effect of the chemical treatment of the rung is this The chlorine gas contained in the ceberide of lime attracts oxygen and moisture from the sir, sy which muritait said is formed. This eats away the vitals of the fabric. Sconer or later the wool and cotton in the rung become britis, and thus weaken the warp and deteriorate the wool. When this deterithe warp and desertorate the wool. When this deter-oration is complete, the pills of the rug may be awapt away by the ordinary process of awapting, and the warp, which is the foundation of the rug, becomes so weak that boles appear here and there, and soon the rug is worthless.
It not seldom happens that a Persian rug is too

glaring in some bright hue, porhaps red, and is not salable. An unscrupulous dealer will subject the rug to the series of washings in chemically prepared watto the series or wasnings in enemically prepared w in this way he turns out a rug possessing a soft tique sheen that is truly captivating, and finds a re purchaser for the doctored floor covering sing a soft an

#### A New Comet Discovered in South Africa.

A new comet visible to the naked eye was discovered at Johannesburg on January 16th by Innes, in right cension 19 hours, 60 minutes, 28 se tion minus 23 degrees, 59 minutes 24 seconds.

At the time of its discovery the comet had an hourly motion in right ascension of plus 41 seconds of time and declination of plus 6 minutes 4 seconds of arc

The comet discovered is brighter than Venus. At Lick Observatory it was easily seen with the naked eye at noon about four degrees east of the sun and onehalf degree north of it, moving northeast

For a few nights the comet was a brilliant object in

the clear southwestern sky just after sunset. Readers of the Scientific American will hardly con fuse .bis comet with Halley's, which has been the ob-ject of constant study since September 11th, when it was sighted The South African body is one of the two or three comets which are usually discovered SVOTE TOST

Dr Joseph K. Pogue who is in charge of the Divi recently described in the Smithsonian Miscellaneous Collections a remarkable specimen of pyrite studded Collections a remarkable specimen of pyrite studded with crystals of gold and party covered with plates of galean from the Snettlebam district near Juneau, southeast Alakas. The pyrite is in the usual form of a cube, but what is very remarkable is that there are not it more than one bundred and thirty well-defined crystals of metallic gold. These are also in the cub and system and from one-third to one-half burded in cal system and from one-third to one-half buried in the pyrite, never more, and seem to have no definite relation to the crystallisation of the pyrite. Similarly, crystals of galean and chalcopyrite are found on the pyrite. The structure and relation of the galean to the pyrite is of considerable scientific interest and is described in technical detail by the author. This very unusual occurrence of these minerals in crystallo-graphic juxtaposition is described by Dr Pogue as follows. "The pyrite, when its present size was nearly attained, sustained a deposition of crystallised gold maximed, sustained a deposition of crystallised gold upon its surface followed by the precipitation of small amount of chalcopyrits which, in turn, was su-ceeded by the formation of the galena. A further slight accretion of pyrits completed the development of the specimen.

Failure of a fly-wheel, says Power and the Engineer, usually begins by the starting of a minute creation the under surface of the rim at the point of greates stress, vin, near the ends of the arms adjacent to the screen, vm, hear the each of the arms acquest to the rim joint. The create gradually deepen quilt failure occurs, with all its disastrous consequences. These minute creates are visible to an experienced eye, and careful impectings will did metarishing in the prevention of fly-wheel explosions.

# REGRETLY PATERTED INVESTIGAT.

RESERVE PAYERTED LIVERTONS.

RESISTED STREET STREET

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lang one is made in the receiving machines

PLAIN J Cutanta Currens, Venemola. The purpose of the intentor is to provide an improvement upon the old Arabian pless still widely used in the Kantish republics, whereby to render the said type of plow more efficacious without complicating its construction and to better adapt it for use in mountainous dis-

tricte.
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COTTON GIRKENIA AND CLI TIN VITOR —

B. HARLITON Gooldinals. Years in object here is provide a diver by means of which the suit the require ments of various grades of soil.

Partiers, to previde service where services of soil parties, and adjusted positives means by which the plower of the cultivation may be simultaneously raised adjusted positives. Mr. Hamilton has in vented another checker and cultivator for use in simultaneously raising and lowering a for simultaneously various of the control of the

JOINTER ATTACHMENT FOR PLOWS. JOINTRE ATTACHMENT FOR FLOWN.—
P. S. SHIME, sherre Oblo. Means an provided for detachably connecting a single or dembe pointed jointer blade directly upon the standard of the plow share and near to the model board forming an upward extraord method to be shown as the connection of the sheer with one, and turn such cut material as well as one, and turn such cut material as well as the force formed by the progressive success of the board and plow share.

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might occur

OARPITURE.—A JARMOLOWREY New
York N Y In view in this present insertion
is a construction in which the lighter, as it is
revalved moves the controlling valve to turn
the controlling valve
to turn
the controlling valve
to turn
the lighter it is an improvement
on a former patent granted to Mr Jarmolowaky

#### Household l'tilities.

Honoschold Tellisies.
AUTOMATIC DAMPIES OPERATING DIS-VICE - F JI MULLUS Lans.ais, In This invention provides norm insume for simulation outly operating the dampers of a recoking to extra a model of the provides of the pro-tor extra a model of the provides of the burning condition and means for conding an alarm at the anne time the dampers in the range are adjusted to produce free draft therein

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may be anchored and improved means for at tachment to a stump or other obstruction which is to be removed

which is to be respored ROK KDRILL L. F. Rizanos, Denver, Colo-and W. A. Birrawoon courtland Aris. In the present patent the improvement haive to drills the more particular purpose behand the provision of a type of drill sepecially and table for work in rock and similar hard sub-stances and possessing a number of construc-tional advantages whereby its utility is gratly increased.

hirrows: MATHER YOR MAKING COMPOSITE PABRIC — Francis and W B Peracus. New York N A undjet her is no provide manual for delivering a plurality of layers of material under proper tendon to an assembling and folding device. Further to provide means for delivering a plurality of layers of material to a compressing derive in a peculiarly assembled relation and under a proper.

INBIRT'S DRVING MATHINF S. R. ZHINKE Teledo Ohlo. The intention in this case is to produce a machine with can treat a large quantity of bristles and which oper arts in councilous with a digitage current of but all? The bristles are treated in such a thing the second of the large current of the second of the large current o

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adapted for use in the class of matchines
whereh a single resistion of the driving pulls,
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rotation is manually controlled.

rotation is measually controlled HAYBLING MAYCHINF FOR ILMKETE, FOR IL

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mechanism may cause the return of beer to the kegs, the cleaning of the colfs, pipes and faucets and the draining of them parts, thereby leaving the apparatus clean and ready

thereby hearing the apparatus class and relation for the following control of the following cont

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Ballways and Their Accessories, MAPKTY DEVICE FOR BULLHOAD PROOF — I T WATON, Gage City Kan This d-vice is adapted to prevent a person withing from the track, thus prevently the numer-ous avidents due to premos wedging their free to there he rails and being unable to activate themselves before the down to fast morting the control of the control of the rail of the control of the control of the control of the rail of the control of the control of the control of the fast morting technique.

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which can be mentputated rapidly and easily Micha Clus Wilfield. J T Passe and M T Batta, Ja, Chariston, W Vs The main time of a pint roboding the wheel on the start, with improvements for loosening the old pint it has been proved to the start, with improvements of long if the latter should become jammed for keeping the hub on the wheel which is med shaped to the damage of the pint, and the pint of pint of the pint of pint, and the pint of pince, but which is held in pince by means of an MSSM ILLNINGET BANKEY M. MYCHEM - 4.1.

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Teas, It is the usual practice to connect the
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body occuparative therewith to fock the this in closed position, limit its alishing movement in the opening of the loss, force the lid when closed, in a direction to bind the lift to the loss hody, and when open to thirdcanally retains the lift in an open position, and in construc-ing the bor so that the location means can be discussed only by a special key

Professings to Yohiston, VILICIAN BAIKE—TA RIGORNAM, Mow-ark, Oblo The aim in this case is to pro-vide a brake for use in connection with motor yellocies and the like, by means of which the which can be brought to a sudden stop with out arresting the rotation of the driving wheels, so that the strain you the motor, incident to the sudden application of the ordi-nary brakes is obviated.

nary brakes is obviated.

RINNING-GRAR FOR WAGONN.—W J

Ors. Merlin, Ore . In the present patient the
purpose of the inventien is to provide norsi
details of construction for a freight basiling
wagon, which are light strong and domble,
enal/s a quick turning movement, largely prevent destructive were, and that may be preduced at a moderate cost

direct at a moderate cost MATON - O KRILLEN New York N Y The object here is to provide a motor or explosion engine of the two-cycle type servange to util less the motive specific type servange to util less the motive specific to the fullest advantage by gridge continuous lengules in proper rota by gridge continuous lengules in proper rota from ruming of the cycle and home permit the use of the motor on automobiles and the like

ANTISKID ATTACHMENT FOR VEHICLE-WHEREA.—T T CHALORER, New York, N T The inventor's object is, to provide a device, several of which are adapted to be attached at intervals to a wheel of an automobile of the like, to protect the tire and at the same time prevent the wheel from stidding

dispensed with JOINT-COVER. A G WHILLAMS, Hidney N Y This cover for protecting a ball joint, comprises a firstlike slever adopted to be opered out in the form of a flat sheet and provided with an opening on its side, with the walls of the opening formed of an clastic material and adapted to be expanded over the ball of the joint and closely flat around the member to which the ball is secured.

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VELEXCEPURE.— M HATTER, New York, N

Y Through the medium of the clutch a continuous movement can be imparted to the drivling sale and when two clutches and accounties of the whole will be positively unitare
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momentum of the vehicle after one neverosate
of the podal or lever will carry it forward
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mutil the clutch is again brought into active

operation

LOADING MACHINE, 41 Kauna George,
LOADING MACHINE, 41 Kauna George,
Lowa This machine is especially adapted for
loading manure into a wagen An object of
the invention is to provide a device capable
of lifting large loads and of depositing them
in a waiting relicie witout the use of engines
or other power generators, the action of the
machine deposing entirely upon the power
supplied by load.

amplied by head CARRAGELAMP BOX.—B. M. Cota, Democracy, Ohlo. The object of the investion is to pervide a local or ruse, to be executed leasest the bottom of a huggy, to carry an ordinary stable leastern so that the instrem may act as a carriage lamp while driving, and as a lan tern when out of the buggy or carriage and to serve also as a beater for the buggy or carriage.

DESIGN FOR A FABRIC FOR WINDOW STIADES OR SIMILAR ABTICLES — A BOKK, NO YORK N T The design prested in this case is an ordinal recognization of the contract band in the former design.



Fall hints to correspondents were printed at the head of this column in the issue of March 18th or will be sent by mail on respect.

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incular No. 2000. For the address of free man-NOW AN AWAYERS GAY TIND WALLEY'S

(Continued from page 102) (CORMMON FOR PAGE 102)

It. It appeared like any one of the
many faint stars in the field of view
I should think it was about the eleventh
magnitude on November 30th The
sphemeris makes it a little fainter, but Insulars No. 8674.—Wespet to buy old people to be stated in the Scientific American control of the state of t

(Concluded from page 100)
Atlantic type and the six-coupled type Attantic type and the six-coupled type which succeeded it in fast passenger service. Commencing at the tender, which is of huge size in itself, we note that it is carried on two six wheel trucks, a novelty is tender construction. The tank capacity is 4,000 gailons of oil and 12,000 in the fire tubes, and 1,279 square feet in the feed water heater tubes, making a total of 4,756 square feet. In the super

total of \$,750 square reet. In the super-heating and re-heating section there are 1,121 square feet of tube surface. The firebox is built up of steel plates, finneed to a channel section and rivoted together with stay plates riveted in be-tween the opposite flanges of the outer and inner shell. The fire tubes, 21 feet long, terminate in a combustion cham ber, 10 feet, 9 inches long, which con-tains the super-heater and the re-heater The front combustion chamber, which forms the feed water heater, contains 417 tubes, 214 inches in diameter by 6 feet inches long
The boiler with its superheater a

feed water heater extension is connected rigidly to the frame in which are car ried the pair of trailing wheels, the six coupled drivers, and the high pressure cylinders. The low pressure cylinders, the forward truck and the four coupled drivers are carried in a separate frame and the weight of the forward portion of the boiler, feed water heater, etc. is carried upon this forward truck by means of two sliding bearings which allow the frame to move laterally under neath the boiler, as the locomotive enters upon a curve This necessitates employ ing a flexible steam pipe for conveying the steam from the re-heater to the low pressure cylinders and the necessary flexibility is secured by using both slip and ball-and-socket joints in the steam plps Platon valves are used who countries and the valve motions are of the Walschart type There are two high pressure cylinders, and the valve motions are of the Walschart type There are two high pressure cylin type by 28 inch stroke, type Inser are two high pressure cylin ders 24 inch diameter by 28 inch stroke, and two low pressure cylinders 38 inch diameter by 28-inch stroke The driving wheels are all 73-inch diameter

The general construction of the freight to the passenger ocomotive, but the dimensions, weights locomotive, but the dimensions, weights and power are, of course, much greater. The boiler is 7 feet in diameter, works under a pressure of 220 pounds, and has a total heating surface, including the feed water heater, of 6 651 square feet. There are also 1,746 square feet of super heating and re-besting surface. There are the heating surface. high pressure cylinders, 26 inches in diameter by 34 inch stroke, connected to eight-coupled drivers 63 inches in diam eter, and two low-pressure cylinders 38 inches in diameter by 24 inch stroke nected to eight-coupled 63 inch dr nected to eight-coupled 63 inch drivers The tender contains 4 900 gallons of oil and 12,000 gallons of water The engine alone wolshs 2214 alone weighs 23114 tons, and the engine and tender together weigh 350 tons. The total pull on the draw bar maximum

ower is 54 tons.
It is no exaggeration to say that these locomotives mark a new era in American locomotive practice, for although the Mallet system, super-heating, feed water ng and compounding have been tried out senarately on various locomotives, this is the first time that these refinements have been embodied so com-pletely on a single type

Home-Made

**Experimental Apparatus** 

if there is any neivertife, mechanical, or en-ineering subject on which special information i desired, some papers will be found in this stalegree, in which it is fully discussed by supposed authority compass agreeity
A few of the many valuable articles on the
making of experimental apparatus at home are
given in the following like
ELECTRIC LIGHTIMS FOR AMAZURUES
The article talls how a manil and simple experimental installation can be set up at home
felentific American Supplement 1531.

AN ELECTRIC CRIME AND HOW IT MAY
RE CONSTRUCTED AT HOME, is described in CONSTRUCTION OF AN ELECTRIC AN SUPPRIMENT INC.

EOW TO MAKE A 100-MILE WIRELESS
TELEGRAPH OUTITY Is told by A Preferich
Collins in Scientific American Supplement 1600

A SUMPLY TRANSFORMER FOR AMA
TEXTS URE is no posing described in Scientific American Supplement 1787 that anyone can
the American Supplement 1787 that anyone can

THE CONSTRUCTION OF A SIMPLE PRO TOGRAPHIC AND MICRO-PROTOGRAPHIC APPLICATUS is simply explained in Brientise American Septement 1974. A SIMPLE CAMERA-SHUTTER MADE OUT OF A PASTEROARD BOX, PIRE AND A RURBER BAND is the subject of an article in Scientific American Surgiceset 1975. NOW TO MAKE AN ARROPLANE OR GLID-ING MACHINE is explained in Scientific Ameri one Supplement 1888, with working drawings.

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Supplement 1460, with working drawings.

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(Continued from page 113) lately, it has been quite rapidly of late

quite rapidly of late
In looking for a comet one must not
be too credulous, and think that the first
object he sees is a comet Many times I
thought I had found the comet and could see even the tail, but it proved to be rely a star clongated by the shaking of

the telescope

Now the same manner of proceeding may be applied when the comet is near any other star, though it will not soon be so desirably located as on the evening of November 10th After the comet is November 10th After the comet is bright enough so one can see its tall and head, one would not need to go to so great trouble but could systematically search a limited and definite area near it, and in a short time would be able to pick it up But it is not expected that it will be a very conspicuous object in a small telescope before the close of winter or early spring in the meantime the ambitious smateur astronomer can satisfy his interest by studying it in this man

As an aid to those who may wish to try this plan, it may be observed that the evening of February 5th is favorable because of the comets proximity to Epsilon Piscium Epsilon Piscium is in R. A. 0 hr 58 min, and Dec 7 deg 24 min From the ephemoris given for February 5th the the ephemoris given for February 5th the following is its location on that evening R A 0 hr 57 min, and its Dec +8 deg and 11 min Similarly it will be found close to Delta and 62 Piscium on Febru ary 17th, and March 6th it will be just north of 5t Piscium Rs motion is much slower during February than for the two preceding months, and so its location ought to be an easy task for the evenings odiately before and after these dates

Where the neighboring star is not as conspicuous, as in the case of Aldebaran one must study the constellation and familiarize himself with the stars in it ntil he can locate the flesired star is often somewhat tedious, as a few weeks ago, when I tried to locate it among the many small stars in Taurus directly above It is, however, a helpful study

I had a very gratifying and profitable s inso a very grantying and profitable study on the evening of January 14th, as may be seen by the cuts January 15th was the evening of nearest approach to Omicron Piscium, but as this was a cloudy night I decided to try the following night I had searched but a moment or two when it appeared in view I have seen it two or three times since November 30th, but it has never appeared so dis tincily as on this evening It is still faint, though but a few seconds of are in sixe, and could be easily passed over if the observer is not careful It looked if the observer is not careful. It looked more like a small nebula. I could not state definitely but it appeared as though it had a faint nucleus. But the most It had a hant nucleus. But the monitoring gratifying result of the evening's study was the unmistakable motion detected as is clearly shown in the cuts Stars A and B were about twenty minutes of are apart. The amount of motion could not be determined accurately with the 45-power, and the comet is still too dim to use the higher powers. I have had no further opportunity as yet to pursue this phase of the study but shall at the earli-cat possible moment. It will suggest a problem for other amateurs. I anticipate for many other amateurs as much delight in the scrutinizing of Halley's comet as I have already had

It is estimated that the German Empire has nearly 35,000 000 seres of forest, State German forestry on scientific lines has resulted in raising the average yield of wood per acre from 20 cubic feet in 1830 to 85 cubic feet in 1904 During the same period it has trebled the proportion of the sawn timber secured from the aver age cut. In fifty-four years it increased the money returns from an average acre of forest sevenfold, yet to-day the forests are in better condition than ever before

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#### KAHN SYSTEM



## **ATurn of the Crank Saves** 2 Men's Pay



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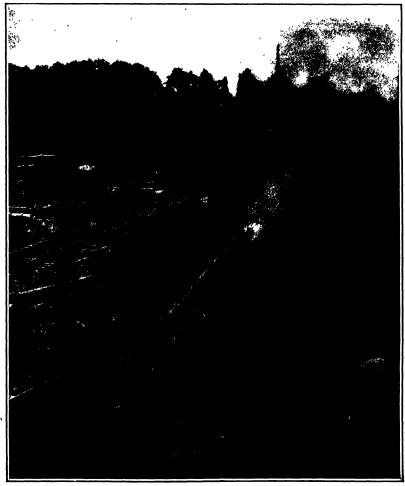
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Discharge et an 8-inch navy ritte at indian Head Naval Proving Ground WEAT SECRILESS FOWDER HAS MADE POSSELL.—I.—[See page 121.]

## SCIENTIFIC AMERICAN

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MUNN & CO Inc., 261 Broadway, Yew York
NEW YORK, SATURDAY, FEBRUARY 5th 1910

The follow is always plad to revolve for examination illustrated article on subjects of timely interest. If the photographs are sharp, the article short, and the farin authorate the contributions will receive special attention. Accordant articles will be paid for at regular space rates.

#### LESSONS OF THE PARIS FLOOD

I is rather surprising that in all the voluminous descriptions of the Paris Bood, which have been published in America, there has been given no complete analysis of the meteorological conditions which have turned the unually gentle and tractions which have turned the unually gentle and tractions and the properties of the sense united that any mere ratinful in the watershed of the below could have been sufficient in the watershed of the below could have been sufficient behind that the present such that the sense of the below could have been sufficient belief that the start part, if not the major part of the Bood water, is due to sudden multing of the snow in the mountains and on the higher levels.

Apart from the extreme suffering and personal love. Apart from the extreme suffering and personal love apart for the calanity is the disastrons reflect which expect of the calanity is the disastrons reflect which must surely result from the loundation of the foundations of the city, and the fooding of its labyriath or situation of the city, and the fooding of its labyriath or great depth pressure and violoty it is a fact, well understood by confineers and architects, that foundation material which is perfectly stable in the dry condition, may begin bee much, if not all, of its supporting power when it becomes saturated, and particularly, it is in the present case, the ground adjoining the condition in full of such voids as are represented by subways, severs, colars and other excavations A subtartatum which will remain stable under normal conditions, may begin to flow or side when it is saturated, in contrast will appear in the superincent with, it indeed the building his not thrown

Parthermore the cabled reports, referring to eaving streets, burstless savers and rollegating subways, indicate that another most destructive action of the water must be actively at work. We refer to the subterrance in the substantial of the

Inquestionably, one result of the flood will be the moderathing of public works designed to prevent any resettion of the disaster. An obvious plan would be to build a masony resisting wall, or leves, throughout the whole length of the city and for some distance above it, earrying the work to a height sufficient to purcent any future overflow. So enormous has been the volume of water that has come down, that unless the value were sarried to an inconvenient height, the country of the control of the property that sould have to be condemned for this purpose would seem to be not of the quantity. There can be little down that the overflow at Three on the little down that the overflow at the control of the control of the property that sould have to be condemned for this purpose would seem to be out of the question.

There can be little doubt that the overflow at larks has been greatly increased by the presence of so many mesonry bridges, each of which embodies overall bears mesonry pleas that greatly reduce the area of the channel, and if the municipal engiments underlinks a sufficient enlargement to above

# Scientific American

intely prevent future overflows the beneation of the obstruction presented by these bridges must surely come up for consideration Judging from the reports it would seem that not only the piers, but the superstructures of the bridges themselves have served to dam the waters and split them over the adjoining

#### THE NEW YORK DEEP TURNEL WATER SUPPLY.

WUGED from the standpoint of sound engineering and practical utility the plan to carry the new five hundred mittion galion per day Catability water supply through the length of Manhaia Island in one large deep tunnel, cut through the everausting rock, is one of the most commendable projects ever brought before this (iv, and we feel that a strong protest should be made against the attempt to discount of the control of the c

certain more or less interested parties.

It is unfortunately a fact that in this age of sensationalism there is no more fruitful field for the pasticular than the result of the pasticular than for bandlevalt uses only by the curb and but them for bandlevalt uses only by the curb and but the more bandlevalt uses only by the curb and but the pasticular than the

to the proposed tunne, which will vary in diameter from 11 to 18th, from 110 to 18th West leverton 1 to 18th, from 110 to 18th West levervolr near Yonkers, below the Bronx, the Harlem River,
and throught with the full length of Menhattan leads,
and thence, below the East River, to a terminating
point near the Atlantic Avenue Station of the Long
leiand Railroad From this point pipe times near the
surface will extend under the Narrows to Staten island

and northeast into Brooklyn
At the Bill View Reservoir at the north a 300-foot shaft will be sunk, from the bottom of which the great tunnel will be driven to the scott it will be constructed at sufficient depth (spoterally from 150 to 200 feet) to insure its lying everywhere in rock sufferies to the preservoir of the water, and as a further suffequard, it will be lined throughout its length with concrete The total length of the tunnel will be seventeen and one-half miles and at 4 000 feet intervals construction shafts will be subtracted when the job is completed these shatts will serve as uptake shafts, with connections to the surface system of pipe distributions of the surface system of pipe distributions.

tion must valuable advantage of the deep tunner matched is that in Lower Mantata, Brochus and matched is that in Lower Mantata, Brochus and Blaten alend, the water will be delivered at a greater elevation by about 100 feet than would be possible if the surface pipe lines were used, and water will be adjusted to 120 feet above tide level. This great difference is explained by the fact that the frictional read and extending the shole mass of water in one large single conduct. Other advantages are that, since the tunnel can convey as much water as thirty 4-foot pipes, the cost of construction and the annual charges will be should be accurately as the same charges will be should be accurately and the same charges will be should be a great coloured or being sensely for reads, that there will be impossible; that there will be a great coloured or subsequently for reads, that the prevent of the control of large configurations, and leastly, that by cross-connection of the tunnel with the existing water-supply system, the latter can be antequalized against any executed of the region of the reads of the control of the reconfigurations, and leastly, that

#### OUR LATEST AND PUPAL REGISEROMATION REGISE RATFLESSIF.

HERBH is no descript the fact that the Back Town of the Community of the C

The "Delaware," which is a sister ship to the Aorth Bakota, "is identical with that vessel in everything but modive power. She is driven by two verticals forcerylinder, triple-expansion engines, which embody the very latest developments of the type, with piston valves, forced subrestation and shap rotational speed. Sizani is supplied by water-tube bollers, running under the contraction of t

The contract called for the development of \$5.00 maximum horse-power and a speed of \$1 knots. In the trials the engines developed a mean horse-power, on the varies over the mile, of \$2.50 '3 and a mean speed of \$11 knots. The maximum horse-power developed to a single mile was \$3,000, and the maximum speed \$1.98 knots. Interest, naturally, centered on a comparison of the performance of the "Delaware" instements of the performance of the "Delaware" instements with that of the "North Dakots' turbines, because the performance of the "Delaware" instements of the performance of the "Delaware" in the performance of the "Delaware" have maximum to the performance of the "Delaware" showed a superior efficiency at all speeds in the consumption of steam. Now, white superior rule economy may be and its often affected by the quality of the coal and the degree of skill of the fireman, and, therefore, may be credited more to the stoke-hole than to the eighte room, the steam or water consumption is determined aimont entirely by the efficiency of the engine, and it is on this last basis of comparison that the endea the "Delaware" have made such a remarkably meant the "Delaware" have made such a remarkably meant the "Delaware" have made such a remarkably meant the performance of the p

fine showing.

In the 24-boar run at 19 knots the 'North Dakota' burned 295 tense of cast, with a water consumption of 1957 pounds per horse-power per hour, and the 'Delaware' 315 tons with a water consumption of 1458 and 18 knots the 'North Dakota' burned 185 tons with a li li knots the 'North Dakota' burned 185 tons with a water consumption of 23.94 pounds, and the 'Delaware' 111 tons with a water consumption of 23.94 pounds, and the 'Delaware' in 10 tons with a water consumed per hour 'The total water consumed per hour by the turbines of the 'North Dakota' at 12, 19, and 21 knots respectively was 15,000 pounds, 23,500,00 pounds and 38,000 pounds and 186,000 pounds from the 'Delaware' for the main engines was 5,500 pounds and 38,000 pounds and 31,000 pounds. These figures, considered on the score of steam economy, are greatly in favor of the reciprosating segion, and they indicate that the cruiting radius of to "Delaware's consideraty larger than that of the "Delaware's consideraty larger than that of the "Delaware's consideraty larger than that of

Why then, it may be saked, is the government committing itself to the steam turbine as the drives for future battleships? The answer is, first, that the Theologies' turbines have been greatly improved upon in later models. The number of expansion stages has been increased, and the steam economy in the sent possible of the steam of the steam of the steam in the steam of t

The French Deputies were presented recently with specimes of the new aluminium coinage with which it is proposed to regime the Promes coins in France. The 10 conjuling piece is described as "complaint where a country and a torquer better," and in half to be even Jess attractive in appearance that a block to be a support of the proposed of the propo

## ENGINEERING.

An superineedal road has been constructed at Truro, which it is claimed has the advantages of being registant, must not dust proof, noiseless, and requiring an removal of the old surface. It consists unsides, down on the roadway sheets of expanded steel striffer to those so largely used for the restorcement of concrete, and laring over it 2 a finch depth of ord-Paper, road material treated with coal tar, and rolling

The final plans of the new Arguettae dreadnoughts have now been passed. The stripe will be called "Rivi-davia" and "Moreno". They will be of 26,000 tons distributions and arry twelve it inch, review 5-inch, and twelve 4-inch guns. The speed will be 22 knots There will, it is said, be two funnels and two skeleton masts of the new American type. The whole of the twelve guns will bear on other broadsie. The contract for these ships has been swarded to the Forn River competition for this order mone, the leading ship-builders of the world, the securing of this contract is a high tribute to American highlighting.

a high tribute to American shipbuilding American Company has been organized to build a line from Testutian, State of Puebla, through the State of Venezuru, to the port of Nautia, says the Mexican Herald The \$2,000,000 gold capital has all member of the board of directors, says that the line member of the board of directors, says that the line control of the test of the control o

According to the United Service Gasetie, the first airship for the Brittien sary, which is now being built by Vickers, Sons & Maxim, will be the largest reased of the kind in sustence it will be over 600 feet in length and driven by two motors of 200 horne-power each, which will be capable of driving the vessel at 6 miles an hour is still air. The nominal litting in this authority, will not exceed let vome it in a first problem of the property of the propert

There are over 400 miles of railway now in operation in Guaramala and various extensions are in proport. One of three contemplates the building of a line from Zecapa on the Northern Railroad, about miles from the sea, to Santa Ana, on the northwest are frontier of Salvador, where it will connect with the British railway already built, and thereby with the april at Salvador. Much of the roften one with in that republic will thus find an outlet to the Atlantic of which it has long been in seed, and it is high probable that the built of the import trade to Salvador will also be conducted along this route

In his first annual report, Secretary of the Nary Meyer ando for only two hattleships and one repract ship. These battleships he recommends about the order all-bigs. These battleships he recommends about the order all-bigs. Type They will complete the squed on of eight vessels of that type A repair ship is accumely desirable, in order that the flest may be made more solf-austaining. Mr Meyer favors the building of practically all the new vessels under contract with private shipbilliding concerna, not only because these industries should be fostered, but also because the construction is more secondical when done by private concerns than at the government many yards.

There is a bill before Congress providing for a boad base of \$10,000,000 for entrying on the work which is now under construction and contemplated by the Bulled State Reclamation Service A complete description of this noise project for bringing under culturation arid and semi-arid regions of the West was given in the Middle West Number of the Eurarymet Ausman of December 11th, 1969 It is exposed that by the close of the next year about two million serves will have been reclaimed at a cost of \$70,000,000 will have been recovered and opened for seltiment.

have been recovered and opened for settlement.

We have received the report of the Public Service
Commission of the First District of the Bills Service
Commission on the First District of the Bills of New
York, which contains some interesting facts. The
number of socidents in street and steam railroads
which the city of New York was 64,841 in 1904, while
in 1909 the number was reduced to 53,815. The number of persons thilled decreased from 444 to 535, which
is an encouraging decrease. The sorvice rendered by
the transportation compalate is now better than ever
header in Nedeck in year-profice to the sphrieds cointitions
of the transportation compalate is now better than ever
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this photographer.

## Scientific American

#### ELECTRICITY.

The United Improvement Association of Boston is urging the electrification of Boston railroad terminals. It is considered very probable that the matter will be taken up by the Massachusetts Legislature A rough scittants of the card of electrifying the terminals and ruburban lines is placed at between \$50 000 000 and

The PRth Annual Electrical Show, which was hold in Chicago from January Holf to 29th was unusual for its beauty of decoration. The Collissum where the chibition was hold was roofed with a canopy of timed and ribbons which were lighted up by means of two hatteries of assemblights. The colored light at word in the pold and silver timed produced an extraordinar ity spiendid egits.

Blocketo power in furnished to Hollander, Debmark, from Beeden by means of a cable with runs under the narrow see separating the two countries. The power is generated at a 90 foot fail of the Laga River is Sweden and is conducted to the coast by means of coble, where it connects with a submarine cable three miles long. The transmission of power by means of a submarine cable is quite unusual.

A demonstration of the use of electricity as an ansestative was reveally made in Hartford, Conn where a patient was thus ansestabilized while one troops to we represent of the his foot. For the cut retroes too were removed from his foot. For the cut retroes to we retroes of the his foot. For the cut grots and the other to the askie During the operation the patient, who was billadfolded so that he would not witness the work of the surgeons fell no pain and chatted and talked in a natural manner. When the operation was over he experienced no after effects

From time to time estimates of the power of a light oning discharge are published which would give on the idea that every discharge represents an enormous current. On this point Prof. Elikin Thompson, leviar ing at Princeton University on "Atmospheric Electric ing at Princeton University on "Atmospheric Electric ing the Princeton University on the current of the power to a lightening that The current in a factor of the present of a lighting that The current in a factor of the property of the princeton of the protain the current cases of the princeton of the protection of the princeton of the proportion of the princeton cases of the thousands of amperes It is doubtful if the potential much accord at any time more than a few millions of voits as it is probable that small level breakdowns start the disroutive process which these cateous through miles

Pollowing the recont stack on anatour wire less religion of the properties of a bill before. Only reas to limit their activities the manteurs are banding themselves together to resist any action which would interfere with their liberties any cardion which would interfere with their liberties and some seas of signals sent at the amen time the own which he wishes to hear as seen operator has his is as easily recognisable as the volce of one man in a rowed. Also that if the preferedonals care to go to the expense of installing the necessary apparatus they are not out all the signals except those they wish to receive. While there are many thousands of amateur actions in this country very fore of them are capable of transmitting a message more than a tew miles and manufactures of the contract of the contract of the contract of the country were the contract of the country were the country were the country with the country with the country were the country with the country with the country were the country with the country were the country with the co

The new Egner and Holmstrom microphone transmitter was lately given a test on various inter datasets as a first as Paris and the property of the second of t

#### SCIENCE.

During the month of January, 1910, four comeda were at one time in the heavens. The first of these is Halley a comet, the second Winnecke a, rediscovered at the Observatory de is Piata on October Slat by Poro, the third is Daniel's, and the fourth inness."

The Austrian Ministry of Public Works is trying to settle upon a place where radium may be sold, and the price to be charged. The question cause up when a quantity of ore shipped from Joschinstinia was found to contain no less than one gramme of radium. The price of this small quantity has been fixed at 189 cross as (877.1) a milligramme. Those who centers the property of the property of the property of the tred at 1the Ministry of Public Works in order to receive information as to quantities and current prices of radium.

Dr B G Acheson was presented with the Perkin medial at a recent meeting of the Chomists (Tubb in presenting the medial Prof C F Chandler traved the history of the decreation and told how it had been conferred upon fill William in Perkin, Dr J B Francis Hermshoff, and Dr Arno Behr J A Acheson received the programment of the Perkin Professional Conference on the Perkin Professional Conference and now indispensable to the world The substances with which Dr Achesons name is associated are carboroundum, deflocculated graphits, and Engrithanized citys.

The New York Aquarium had a greater number of vatiors during the year 1906 than ever before, the altendance being 3,803 501 an average of 10,417 a day These figures show that the Aquarium has a greater patronage by the public than all the other museums of the city including the Zoological Park combined, and 1,800 500 more, for the same period than the New York Hippodrome which has probably the largest attendance of any theater in the city. These flatures are not also the combined of the combined of the city of the combined of the combin

The first spectroscopic observations of lithleys comet, made at Meudon by Desiandres and Berand, reveal clearly marked discontinuities in the spectrum of the count of the faint certinuous spectrum is excussed by distinctly stronger lines capecially in the ultraviolent region on December fifth the cumet showed a nearly circular nucleus from which extended two curved rays of feelib brillians, but distinct, and rescubling in form the antenam of an insect or the promps of a two-promps of the proposed of the comet is proposed to the diminished. These first observations show that the count is airready self-luminous and that the light is due partly to inconderson gases.

askered, whith separate to be reviously varied animals of the built between the control of the built between the bound of the Bolton of the Paris observatory. In examining a being discourable made on Covicher 19th Bolton observed as he tall linear trace. As the star images on the plate were perfectly round and sharp, it was evident that the trace was either a defect in the photograph or the impression made by a plant in order to verify the observation, another photograph of the same part of the sky was made on October 23rd. The second plate showed the trace, a little to the southwest of its former which appeared to be of the eleventh magnitude. The discovery was immediately reported to the astronomical bursau of Kiel, where the adversid was provisionally designated by the symbol 1899 J. D. Blince the remarkable discoveries made by the tierary brothers the search for sateroids has been carried on almost exclusively by German and America astronomers.

The Treach journal Le Radium describes a long series of experiments made by Blanc, of Rome, in regard to the presence of thorium in various earths and rocks. The proportions of thorium found expressed in millionths of the weight of the mineral, were as notions. Those reportions are thorium found expressed in millionths on the weight of the mineral, were as the contract of the con

# A NEW STORAGE BATTERY STREET CAR

## ANOTHER EDISON INVENTION.

The announcement was made about nine years ago that Thomas A Edison would soon place on the market a storage battery that would be much lighter and of greater capacity than the usual battery and provided with positive and negative elements that would not deteriorate because in place of an acid an alkali would be used for the electrolyte Much was promised

showed no serious effect when rapidly discharged, no damage resulted from overcharging Shortly after the batteries were placed on the market it was found that the graphite became oxidized and interfered with the output. After considerab le research it was discovered that chemically pure nickel could be substituted for

ous one. They had to be about the size of a leaf pub-cil, namely, quarter of an inch in diameter and flour inches iong, with the sides finely perforated. A ma-chine was eventually built which made the tubes out of perforated nickel ribbon. The ribbon was wound spirally with the edges of the coils interiodox and flast-





a radical departure from common practice

Interior of the car with the scats raised to show the batteries placed in the steel girders. A NEW STORAGE BATTERY STREET CAR

for this battery, and a year or two later it appeared The positive element consisted of nickel exide inter-spersed with layers of graphite and packed in perforspecies with agone of graphics and packed in perior-ated nickel tubes, while the negative element con-sisted of iron oxide and the electrolyte was potassium hydrate. Both elements were supported in nickeled steel grids. The battery weighed about half that of the usual storage battery of the same capacity

But soon another difficulty developed. The nickel was packed in tubes of square cross section as would buckle or bulge outward, permitting the pow dered nickel oxide to filter down over the pure nickel layers and insulate them Then it was determined that a round tube would have to be used which withstand the pressure of the nickel oxide The lem of producing such tubes economically was a

amount of money was spent in solving this one prob-lem of the battery.

iem of the Dattery.

Shortly after the batteries were first put on the market they were withdrawn on account of the defects above enumerated, and about two years ago when ttery was finally completed in its pr a large number were sent out to be tested on auto-

# ARTIFICIAL PRODUCTION OF THE VOICE

## BY JACOUES BOYER

Dr Marage has succeeded in demonstrating, by nu merous experiments, that the voice results from an intermittent vibration of the larynx and the air with in it, reinforced by the resonance of the mouth and other cavities situated above the larguz in a recent communication to the Paris Academy of Sciences, Dr Marage supplements this demonstration by proving that the largux alone suffices for the production of

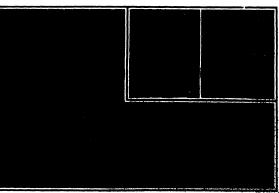
these vibrations In the first of these later experi ments, performed on a living person Marage succeeded in nullifying the action of the hec-cal cavity by fill ing the mouth with 'steut,' a substance which is used by ing impressions of the mouth The steut which filled the mouth was traversed by a ri gid tube which connected the lar-ynz with the external atmosphere Al though the resonant cavity of the suppressed, the five laryngian vowel sounds OO, O Ab,

enunciated distinct-ly by the laryux The investigation was continued by endeavoring to pro-

Ay, and Ee, were enunciated distinct-

from a larynx detached from the body Muller had already experimented with the dead and isolated iar yaz, but the sounds which he obtained were quite different from those of the living larynx, and he stretched the vocal rords by applying forces much greater than the muscles of the larynx can carer These forces, which is nome excess exceeded a weight of 24 pounds, would certainly have torn out the aryte-

noid cartilages of a living human larynx. Hence the conditions of Muller's experiments were abnormal Marage employed, in his superiments, the larynx of the day in order to spare the animal useless suffering, morphice was first administered hypodermically and, three hours later, the dag was put under the influence of chilorotors, and the larynx, with other the influence of chilorotors, and the larynx, with or or six rings of the traches, was excised. A rubber tube of the diam



ARTIFICIAL PROPUTION OF THE VOICE.

ated in millimeters of water pressure.
The compressed air was stored in a rubber bag similar to which are

ster of the traches was then connected with the latter by means of a short tube of thin glass,

so that a cur of air could forced through the

extirpated larynx The pressure of ured with a very sonsitive metallic manometer gradu-

ingo illustrato, religiositrolly, the filtris principal by the inspect by emission a deep just a high motion

# WHAT SMOKELESS POWDER HAS MADE POSSIBLE.—I.

BY ROBERT G. SKERRETT

Emospi for saluting purposes, where smoke making its a factor in the ceremony, smokeless powder has sup-

gas a necoy in the ceremony, minuscens power mas sup-planted the older propellant.

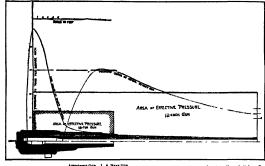
Our biggest battleships could not be given their present powerful armaments had not smokeless pow-elver made it possible to add to the destructive force of our guas while calling for much less weight per unit of energy than formerly

Smokeless powder was first generally used in the Fresch navy at the time of the devolument of rapid fire guns to repel the swift torpedo boat. The use of ly gun powder in those weapons would have biansmakly mm powder in those weapons would have blan-ished the defensive vessel in a cloud and have given a greater chance of success for the torpedo bost. Thus, a milktary necessity demanded the change One-de-valsied, however, mucholess powder became the step-bring stone to a revolution in ordenance engineering. This was due in the main to the differences between the physical actions of the old and the new proposi-tion of the contract of the contract of the contract of the properties of the contract of

Black gun powder has a very dignified antiquity It is a mechanical mixture of saltpeter, charcoal, and sulphur Smokeless powder, on the other hand, is a chemical combination in which the atoms bear a different and a far more intimate relation to one another Common gun powder is a violent explosive and other Common gua powder is a violent explorive and separate its gases with great suddonnes its grains, however, when burned in a confined space are only imperfectly command, and large volumes of smoke are guestated. When used in guas the products of are guestated. When used in guas the products of present the production of the product of the class of the product of the product of the same of the product of smokeless pounder, the charge was short half its weight of the prejectific-double the quantity of smokeless powder required to give the same shallated results Black produce seattle

a very great and disproportionate stress upon the breech of the gun. Thence toward the musie, the present of the gut. Thence toward the music, the presents drops suddenly-capecially if the grains be small and the mass thus easily inflamed Our dia gram shows graphically the quickness with which the highest pressures are developed and the rapid way in middle of these units so that as the consuming flame reduced the outer surface the burning area of the hole was increased, maintaining thus a relative balance of ignited surface and giving a more regular and gradual

dealing with the briefest fractions of a second of time, but measurable intervals that mean everything to the Ordnance engineer
Higher velocities and better ballistics followed But

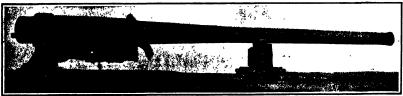


l 8 Navy Gon 1840 Inches

of the old Armstrong and the latest 12-inch navy gur

generation of gas. For a time, this answered But generation of gas. For a time, this answered But the gun grew, and the exposed surfaces of the greater powder charge required effered too large an initial burning area, and dangerously high and sudden pre-sures were produced at the breech of the weapon.

there was actually more smoke than before, the bores of the guns were quickly fouled and there still re-mained a wasteful percentage of unburned grains Such was the state of the art in this country when we went to war with Spain



Weight of gen., 60 teens Weight;nof shell, 1600 pounds ; Powder charge, 505 pounds ; Munic velocity, 5,600 feet per se nal . Missaale energy #8.667 foot-ton THE NEW 14-180E, 45-CALIBER OUR NOW UNDERSOING THAT FOR THE NAVY.

which they fall-the average propulsive force being which they fall—the average propulative force being text a low processage of the maximum power epipted It is this average pressure that sends the shot on its destructive erand, and the alm of the ordnance engi-neer is to have this reasonably high while lowering the creat of the curve of maximum energy. The fart remedy tried was in the form of larger grids, be that, for a given weight of charge, the super-ficial area at eace expected to the flame depend by re-fused the contract of the flame area of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the con-tract of the contract of the contract of the contract of the con-tract of the contract of the contract of the contract of the con-tract of the contract of the contract of the contract of the con-tract of the contract of the contract of the contract of the con-tract of the contract of the con-tract of the contract of the cont

deals burned more slowly, and the propelling force was better distributed along the bore of the gun. This method led to the making of prismatic grains up to an tresh and a haif in diameter—regularly and care-bully formed. Next, a hole was bored through the

Besides this, a big percentage of the grain was blown out of the gun unconsumed Advance for a time was blocked until the powder makers evolved a "slowburning" propellant by changing the proportions of some of the ingredients. The purpose of sulphur is In lower the ignition temperature. The present is a second to the control information was momentarily retarded. By increasing the charcol a greater percentage of moisture was added, and that served as a slowing-up agent in the general combustion of the mixture. The powder that developed was called "not because of its color—the consequence of the underwork because of its color—the consequence of the underwork present in the color of the color of the underwork present in the color of t to lower the ignition temperature of the powder, and by lessening this element inflammation was momencharred charcoal used. In this country, we later called it "brown prismatic." The terms "quick" or "slow burning" are merely relative. In either case we are

Smokeless powder has quite reversed the task of the ordnance engineer. His aim now is to provide an explosive which can be made to suit the gun rather than plosive which can be made to suit the gun rather than to fashion the weapon to meet the violent vagaries of the older propellants. Our present smokeless powder generates a relatively low regular, and progressive pressure from the instant of ignition up to the time the shot leaves the muzzle of the gun with its maximum velocity. The curve of our big 12 inch rifles shows how much nearer the powder makers have come snows now much nearer the power makers have come to solving the problem, but mut hat pitent experiment-ing has yet to be done before the ideal is measurably approached

The operative cycle of a shot moving along the bore

of a gun is exactly opposite to that of a train or care gaining full speed from a standetill in the latter case, the engineer knows that he would endanger his cou the engineer knows that he would endanger his cou-plings—were if he did no other damage—if he opened wide the throttle at the instant of starting. So he be-gins by just acquiring headway and then gradually increases the motive energy until the train has reach definition of the second view of the second view of the speed—a matter of quite several minutes for a fast train and during a distance of a mile or two. The ordnance engineer, on the other hand, can give to his projectile only a fiying start by auddenly applying a great and violent pressure, and enough of this propulsive force must follow the shell to the mustic in order to give the desired maximum velocity. This in order to give the desired maximum velocity. This must be accomplished within a populo of not more than one-hundredth of a second of time and in our biggest guns, while the shot travels a distance of not more than fifty feet. A few figures will enable us to realize better the task set the ordnance engineer and



the part that amokoless powder plays in the resulting when measured by the power to strike an application. The shell leaves the mustle of one of our laisted 12 inch, 44-sallier riften, with a violety of 250 feet a second—13 62 miles a minute—and has a striking force at that instant equat to a blow of 62,632 foot tons. A feat express of 250 ions, thundering along at the rapid rate of 89.34 miles as hour in collision with a standing object, would be able to do at a blow of exactly corresponding magnitude. The quin's misalle within but \$10 pounds and the charge of peaker of exactly corresponding magnitude. The quin's misalle within but \$10 pounds and the charge of peaker mucholess propi land, and yet an wonderfully exquisited in the development of this simpendous energy lated for the development of this simpendous energy that the wayou is actually low is exact time the older 12-fuln rifle dealt with in the diagrams while the present-day gos has far more military value.

present-day gain has far more mintary value.

Referring to our diagram we see how far smokeless
powder has made it possible to improve upon the per-formance of the Armstrong gain of the "elighties".

That gain fired a shell of 820 pounds, used a charge of 130 pounds of black powder and gave to its shot a velocity of 1 400 feet a second the shot left the gun it had a striking energy of 10,980 foot tons. To-day our big 12 inch rifles weighing but forty-odd per cent more than the older weapon, can send their \$70-pound armor plercing shell on errand of destruction with an initial speed of nea 3 000 feet a second-delivering at the muscle a blow nearly five times as great as that of the Armstron gun The 'Mion gun with a powder charge searcely more than a third of that now used, developed the dangerous maximum pressure of 24 tons to the square inch in the powder chamber. Our big 'Wicklew"—using 'b6 pounds of smokeless powder—have a maximum chamber pressure in service of not more than 16 tons. This means a reduction of stress upon the breech of the weapon of quite 33 per cent and yet yielding an average propulsive pressure of something more than 60 per cent greater, all because the present powder burns slower and exerts its driving power for a longer period during the passage of the shell slong the bore of the rifle. It is the difference between the shock of a single, sudden, violent impulse and the better-sus tained push by which an object may be set in motion and accelerated

Burely these are truly autonishing strides, and yet so unobtrustively have they been made from year to year that but few of us have realized their extent and their significance in strengthening our powers of defense and of retalistion Such are the achievements of to-day! What may we not expect to-morrow?

(10 be continued)

A NEW MINTED STATES AVAL OUR OF CREAT POWER.

Our illustration of the new naval is that be un cannot fall to excite widespread interest among those who are following the trend of development in the United Ritates many. The piece was constructed at the Mid wide Works from plans of the Bursau of Ordnance, and received its finishing touches in the naval gun shops at Washington It is now undergoing tests at the Idahn Head Proving Ground which are giving much satisfaction to the officers of the Bursau

There seems to be a greeting conviction among aons of the leading naval powers that, in two of the feating naval powers that, in two of the feating naval powers that, in two of the fact their conganements will be fought at long ranges at which the remaining energy in reases greatly with an increase in the size of the gun future developed will be armed with a piece of larger calibrer than twice in clinic forcat British is building, if she has not already complicited, a 13½ lich kur, and our 14 inch piece has been designed and is now being teated, with a view to putting our navy in a position to arm future derendoughts entirely with the 14-lech the control of the control of

The telescope which is being installed in the Transvani Observitory will be the second largest in the British Empire It will be 75 feet long and have an apriume 26 inches in diameter. The Borkofelier Institute's Work on Infantii Faralysis,

The sayohle machinery in our body is made up of two systems—the corebre-spinal and the sympathetic, the latter does not here rearrers us. The exerbra-spinal system is made up of the brain, the spinal cord and the nerves, which are derived from the cord and strength of the health of the strength of the strength of the strength of the strength of the merces, composed of a cell body gray matter), and the deadfirsts or there while matter). The neurones composed of a cell body gray matter) and strength of the strength of the

The sensory ganglis in the spinal cord, to which sensations are telegraphed from the surface of the body, are in the posterior "horna", thence the sensations are transmitted to the brain cortes, from which in return commands are sent down through the motor ganglis, in the autorior horns of the spinal cord to the

muscles working the affected area.
Infantite partysis is known also to physicians as anterior pationy-sitis (spikes gray, specifs, marrow-aterm applied no doubt when the gray matter was erroncounty supposed to be marrow, and dis, inflammation is of the airctor horns in the spinal core—those parts of the airctor horns in the spinal core—those parts of the airctor horns in the spinal core—those parts of the control of the spinal core—those parts of the airctor horns in the spinal core—those parts of the control of the control of the control of the core of the core of sponsors of the part of the cored involved.

nervatied from the part of the cord involved inhantile partially is generally an acute disease, and by for the greatons sufferent rout, are titled and the partial in the pathon in the circumstance, we would infer tithough not, of course conclusively) the infections mature of this form of partysis. For aimost all the acute infections—measles, searlet fover, whooping cough, and the like—are penetrally disease of child hood, adults and the aged selfom contract them, if they have once contracted them in childhood, because they have not contracted them in childhood, because of the contracted them in childhood, because of the contracted them in childhood, because of the party of the contracted them in childhood, because of the party of the contracted them in childhood, because of the party of

In perhaps two-thirds of the cases that have been studed physic has have concluded them to be latetious, though they could not prove this, in the remaining one-third the disease has been attributed to falls, to anteredent matering fevers, and to homorhages into the spinal blood venues is not higher our present knowledge, however, it is safe to consider that such falls fevers and henorrhages have not been causative of the pallomyelitis but rather predispoing factors making the tissue concerned witner-

the street of th

coline. Singuish circulation, and impaired nutritions. Such as illuses begins undeathy with a high temperature and all the symptoms accompanying a fewer; there is a pain in the back and limbs; modelnly there supervious peralyzis, generally in the lag muscles. A child may be just to bed seemshary quite healthy, and may in the early morning manifest these sufferings. The outlook is ascentily good as to life idsaft, yet the everyity and retaility of the dissease, as in all infections, fluctuate violety; and catalage it all in all, pull-myellid is sufficiently disastronic to the extension of the community in the community of the community is morned larger questro.

ment antice, as it anothe give to consistency of special gives concern.

As infuncted, the infectious nature of pallonysitis has been rather assumed than proved; it would now seem that complete demonstration of infectivity will presently be forthopping. We may then extertain the confident hope of a preventive and immunising agent

against infantile paralysis akin to that which has practically eliminated smallpox from human experiments. But yil a 100 two German experiments real scalars and Popper, successfully inoculated two underly with the spain coreta taken from two fatth busans cases of pallomystiks. In both the membery fastions of the spinist order were on authory found stimular to the spinist order were on authory found stimular to

In September of 1969 Dr Simon Flatner and his colleague, Dr Paul A. Lewis, of the Rockothiele Institute, in New York city, obtained the cords of two children that had unfortunately ided of pallomyellits, in which cords the anterior horns established the characteristic gress and molroscopic appearances. Traismission was then made to monkeys. After either sathests incontaint was made in the brain of these similate through a small trephtee opening. The factor markerial consisted first of emulsions in satisfacts of the spinal cords of the mankery that had developed paralysis after injection of the first emulsies, that from the human cords. The spinal cords in series of monkeys thus incontained showed without exception lesions similar to those of human paleomyellits Now, a single successful loculation with human

Now, a single successful incutation with human virus resulting in experimental palionzyellits could not establish the scientific case here sot forth, because the result might have been due to a transferred text body, but in the experiments of Fenore and Lewis he transfer of the active agency of opidemic infantile paralysis was regularly successful. In one series of seven monkeys the first flocutation was of human virus, the other monkeys were successfully incutated virus, the other monkeys were successfully incutated virus, the other monkeys were successfully incutated to the producement, the disease requisitely resulting. Hence, by these and other equally conclusive experiments, one cannot doubt the infactions nature of palionywillia.

Again, later injections were made, not only in the brain of monkeys but also into the adominat cuts the blood vessels, into mere substance (as in the steatic) of these animals. Nor "one it yet be silled that still other avonues of infection (as the skin, the organs of respiration or the discertive truck) or ceits, for the entrance of the virus into the central nervous artsent.

controlled the second of the stress which is repossible for instantic paralysis. It is at present in visible under the microscope Flexner and Lewis after most chaustive search, have found that it is neither a hatterium nor a protoscon, which parasite have been looked as pathogenie of most of the infections diseases. The virus of infantic paralysis have been looked as pathogenie of most of the infection diseases. The virus of infantic paralysis analizor, it belongs to the oless of the minute and filterable viruses that have thus far not been demonarted with certainty. Neverbeless, although the smallpox virus still remains invisible to us, for a contury past a vaccion has been evolved from it by which we have practically benished this directful disease from the fare of the earth, there should then be no controlled the still representation of the conpagent against pallomyellits should not now in good time be forthcoming

By the way, did the reader note in this paper the phrase "fater either anosthesis" it means that the monkeys suffered no torture during these experiments, so beneficent in their trend for humankind. Let us congratulate ourselves that infantile paralysis is another added to the long list of dwasfur diseases for which a remedy is being found through animal zevolted. So, which could otherwise news have been reviewd.

An Riccire-passumatic Conveyor System for Libraries

An electropronumate system is used in the Berlin royal library for carrying out the distribution of books and the library for carrying out the distribution of books and the content of the content of the content of the library for carrying out the distribution of the blank as employee writes an oracet indication of the places where such volume is to be found the bulletia is them sent by pneumatic tube to the central office. This office is directly connected by elevators with the different stories of the building. These elevators are of multi size and are operated slow, there is a large elevator running through all the floors for transporting persons and books. A set of paramatic tubes the content of the

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The production of mercury at the Almaden mines, Spain, was 1,817,933 bitton, or 25,675 feeden, in 1906. At Minutes it wist SEASE billion.

## Scientific American

### Carresnandence.

# THE STRONGER AS A GLOCK. To the Editor of the SCIENTIFE AMERICAN

In regard to Mr. Baker's item in the January 1st number relating to the gyroscope not maintaining its position relative to the earth, but relative to a fixed point in space, if this be true, the gyroscope, operated by a small motor and set on a balanced pivot, would ake an excellent timepiece, although slightly different from those in present use, make only one revolution in 24 hours The clock would of course have to be set with the axis north and south, so the gyroscope would (apparently) rotate from west to east. It could also be geared so as to denote the minutes and soends, and would be absolutely accurate, with the ex-ception of the slight friction which would have the effect of slowing the clock a trifle

be made use of in maintaining the position of astro-nomical telescopes, if the vibration could be overcome, instead of the mechanical, clockwork devices now in

To anyone who has the inclination to experiment in this way, a timepiece of this character would make an interesting toy, and could be very cheaply con structed. An ordinary toy electric motor should serve the purpose of a gyroscope Edmonton, Alberta. CARL OFSTITUY

## WHY DOES A WATCH-SPRING BREAK!

WHY DOES A WATUR-SPARM PROPERTY To the Editor of the Scipatific American Why does a watch spring break after being in use quite a while? If not strong enough, why did it not

break at the very beginning? Such is the question propounded by the Editors of

Let us suppose a strip of iron to be fastened at one end, the other end boing free If we bend it a little and then let it go it will return to its place after viand teen let it go it will return to its place after vi-brating a certain length of time. It may do the same again and again, when we bend it more and more until finally after being bent beyond what is called the limit of clasticity, it will be permanently deformed Its molecules have then assumed a difficult nosition in regard to each other from that they had be

If we keep on bending it still more it will finally reak in two at the point where the strain is greatest or where a defect may exist

or where a detect may exist

Now let us try a good steel spring liere we find
no deformation appreciable When we bend it be
yond its strength, it snaps at once At least it appears to be so The probability is, however, that a permanent bending takes place first but at a point so near the breaking point that the difference escapes our observation entirely

ing to the other extreme we will take a strip of lead. There is then almost no clasticity, a very slight bending will deform the piece, but on the other hand, it will take a considerable amount of bending

So much for the immediate effects of bending or otherwise straining any given material. But now the question arises, what might be the effect of a strain not quite sufficient to produce an immediate deforma

tion, but applied during a long time?

I can give here an example that I have often the occasion to verify Take a piece of tin and a piece of zinc (in sheet) of the same size, bend them to so extent and fasten them. Two weeks later release them. The tin will return immediately to its former shape while the sinc will remain bent just as it was

Or take a piece of tar and put it on the table will keep its shape, and even stand quite a pressure without deformation or breaking down Nevertheless in the course of a few days its molecules will have yielded to such an extent that the piece of tar h even been able to stand its own weight, and has spread over the table

Now, what has taken place with the sinc or the tar dly occurs with the other materials within undoubtedly occurs with the other materials within octain lingit, at least it seems to me so. The place of iron kept bent near the point of immediate deforma-tion, must in a sufficient time yield and be detormed. The watch spring, or other steel spring, best best too quite shough to break must in course of time break up. The centimed tension of the molecules must have a tendency to displace them, and flushly causes them to yield

We have an immense amount of information as to the immediate deformation or breaking of materials of all kinds under stresses applied at once or during ort time, but only very little concerning the off a most kine, but only very little concerning the offices of prisens applied during a long time. Several expended to the control of the contro se a crystalline structure instead of the origi-

nal fibrous disposition

It is said that a watch spring is more liable to break during warm than during cold weather I am very much tempted to question the correctness of that opin However it may be so to some extent at least

in the first place, as a general rule the strength of all metals decreases with an increase of temperature Between the ordinary limits to which a watch is ex posed, the difference is insignificant. But it is not so as to the expansion of volume. The diameter of the tarrel changes but very little, but the spring, being very long, expands out of all proportion In fact the increase of kingth of the apring is about twenty five times the increase of size of the barrel

That is the equivalent of placing the spring in a smaller barrel and increasing its tension and liability of breakage in proportion Knoxville, Tenn

# SAFETY IN MINES. To the Editor of the SCHNTIFIC AMERICAN

In your issue of December 4th, 1909, in an editorial discussion of the Cherry mine disaster you state flames reached the dust-covered pine timbers of the structural work" This leads to a suggestion that the structural work in coal and other mines should not be made up of pine or other timber at all, but of from or steel Also, from another part of your discussion I conclude that ventilating shafts should be distinct the hoisting shafts.

In fact, the whole subject of protection to the miners should be studied out by scientific mining exp The duty to protect the workmen rests as moral on the owners and operators of the mines and this moral duty is in need of legal enforcement by appropriate statutes State and federal. The men are clearly entitled to protection, and protection would in the long run pay in dollars as well as lives

The whole subject of protection from preventable disasters—and most of them are preventable as is generally discovered after the event-needs to be made the subject of expert scientific study. The loss of life and limb due to accidents in mines, in railways and to burning factories theaters school houses and hotels is appallingly great, the more so when much of it, most of it, is clearly preventable. But right here it must be emphasized that too much reliance is had on nanical signal systems such as block signals on railways and the like. No mechanical system can ob-viate the need of supplementary personal human vigi-lance. There must be still the human watchman to supplement the mechanical system Mechanical sys-tems have their advantages—the advantages of autems have their advantage a-the advantages of su-tomatism But automatism newed the aid of buman intelligence and vigitance. There is too little value placed on human life the lives of workmen, of trav-elers of the apectators at the play, of the children in the great rowded shool bousse. The man who sees his loved once start on a journey is likely never to see them again, or at level (or word) their they alwe, it is not to be a summed to the play of the play, it is to be marked different at the play. It is to be maimed, disfigured cripples. Or the man him self may be stricken in his prime—the untimely vic tim of a lack of care or of undervaluation of human the pres dent of the railway system -as has happened more than once in the last decade—may himself become the victim of his own neglect and may ride to death in his palatial special

ne whole matter of accidents is in a condition un worthy of the intelligence of the country. For one thing, there is lack of constant inspection—eternal in thing, there is lack of constant inspection—eternal in spection, day and night There seems to be an unwar ranted confidence in wood, iron and steel, a gratui tous assumption that accidents are not likely to hap pen The proper wiser assumption is that they are sure to happen unless forestailed. They certainly do happen But somehow they do not seem to be taken into serious account. The plans for running railways, mines, and favories leave the vertainty of accidents so much out of consideration, as if they were mere "sports" of Nature, mere chances, whereas they are the certain and inevitable and hence preventable re-sults of well known factors—factors of wear and tear, factors of growing structural weakness in timbers and steel, factors of ever possible congruity of unfavorable circumstances, the incidental coming together of com-butble supports. bustible elements etc.

bustible elements etc.
In hotels it must be assumed that fires are likely
to happen at any or all times, and there is need of the
etcrnal vigilance of a sufficient number of trained brains to keep the whole area of danger under gent surveilance Mechanical appliances should not be regarded as a substitute for these living inspectors but merely aids. For the automatic system has a but merely aids. For the automate system has a county, unmechanical way of getting "out of far" at the worst possible time indeed it can be depended on to do this very thing. These observations apply to railways, mines, and factories it is not sufficient to have a jury determine whose negligence caused the posigiant or to say that it was due to some imperfection in the automatic signals Prevention is the thing Think what horrible deaths—deaths of scalding, burn-ing, crushing, maining—American men, women, chil-dren and babes are dying almost hourly The sick-ening scene is familiar—the 'unlooked for accident the sending for the nearest village or town surgeons, the "carting away," the "shoveling up" of the mangled remains, the horrible identification of charred remains by some jewel or scrap of a shoc or fragment of ap parel Prevention is the thing through expert sci ontific study and adequate impaction. The subject is of enough importance to warrant it being taken up in the great universities and technical schools, so that men could be trained by proper study and prac-tice to take charge of the important work of saving iffe by preventing accidents it would be a noble and useful work, if achieved—and it can be achieved and useful work, it achieved—and it can be serviced licitized so railways systems should have a depart ment with a trained corps of men to cope with these conditions out of which accidents arise. At its head a competent man, not to operate trains, but to remove the dangers of accidental death sure to arise when all are bent on running the trains on schedule (as now) and no one is thinking particularly of the human entrusted to the rallways system, these dangers would be greatly minimized if the right steps taken There is a railway west of the Mississippi River that has been operated for several decades, and tit enjoys this unenvisible distinction. The road has never caused a single human death 1 have heard also of a steamship line that has never lost a pass This shows what is possible If these con ger's life ditions were general how much happier overybody would be E L BLACKSHEAR, Fellow American Association for the Advancement of

Prairie View Toy

### Ephemerides of Inness' (omet,

In order to determine early positions of Comet 1910 a on photographic plates, the following ephemo-ris has been computed by Prof O C Wendell from Kobald s element, given in H B 383

EPH RWKHIA 1940, November 90 5 December 98 5 December 19 5 December 39 5 1944, January 8 5

From the same elements, Mr F E Seagrave has computed the positions given below

The turrent Supplement

The great bridge over the Red River in Indo is the subject of an article which opens the Current Supplement No 1779 Mr Richards explains some supplement No 1779 Mr Richards explains some principles in design of friction clutches. A new valve gear for gas engines is described and illustrated. An automobile chart has been invented by Mr Joseph J automobile chart has been invenied by air Joseph J Jones which nerves the functions of a unchanical sign post—Briefly the invention is a revolving card which tells the driver or any one in a car exactly where he happens to be upon a road An article on the German "Dreadhoughts" of the 'Nassau' type is published A Lettermoser distusses the present state of physical chemistry in colloids Dr G Hudson Makuen playstad chemistry in colloids Dr G Hudson Maximo writes on stammering and gives some suggestions as to modern methods of remedy at T contingiam strike on transformations and migrations of cels Most of us have probably never heard of Nicole Or come, yet he was the forerculeur of Copernius Prof Pierre Durham does credit to his work in an apprentiation and the continuation of the Parts tambels will be found in the Streyuway, an article case the continuation of the security consideration to the continuation. of peculiar interest in view of the recent inundation of the French (apital

The depth of the water in the middle of the Berlin-Stettil Canal will be I meters (984 feet), and the breath at the surface in ordinary soli 73 meters (19824 feet) In soft peaty ground it will be from 37 meters to 18 meters (1214 to 1246 feet) For a distance of 16 miles the bed and bonks of the canal will have to be puddled with clay, the surface of the canal there being above the water level of the surrounding country. At one point the canal crosses the valley of the river by an embankment provided with a culvert 160-meters in length eleven locks for the descent into the Oder are bogun One of them has a full of 9 meters (2952 feet) The question of building a lift besides the series of locks has not yet been decided. The 37 canal bridges are all to be built of steel

# CLEARING SNOW FROM RAILWAY TRACKS IN CANADA.

BY FRANK C. PERKINS.

The accompanying illustrations show the construc-tion and operation of a novel cylinder snow plow de-signed and constructed in the Province of Ontario when the plow of this remarkable machine is forced into a drift or cut, the snow is lifted by the abovel, which is inclined upward and meets the expeller chambers, the anow gliding along until it comes in contact with the expellers the blades of which revolve at a bigh speed in an upward direction Engaging the snow the blades throw it upward and outward at a great velocity, delivering it to a distance of 50 or 60 feet on each side of the plow and making a clear cut,

feet on each side of the plow and making a clear.

Il feet in which and at a speed of 6 to 8 miles hour in a cut 10 feet deep. The snow is elevated and thrown at so great a distance from the track the possibility of the smallest. quantity ever getting into the ent again is precluded. The snow does not enter the ex-petter chambers, and it is stated that the maximum velocity of the expeller blade at the periphery is 5 654 feet

the periphery is 5656 feet
The accompaning illustrations are front
and side views of this remarkable cylindor
snow plow I none view the snow expliers
are shown in operation, in another a cut 12
feet deep is illustrated The reader will
doubtless not the impression which wedge
and apron leave on the snow The thin end only 20 in hes shead of the exp

Other illustrations show the clusted track in a ten foot cut, and the machinery within the plow car, including the boller steam pipes and engine The expellers are directly nected with the engine shaft by means of two steel chain beits

It is stated that each of the stool ch belts driven by the steam engine of this is capable of driving the expellers at a moderate speed alone, so that should one belt be disabled the plow would still be able to work at a somewhat lower rate of speed The plow body is of steel construction th

the box portion having the sides covered with wood like a box car The roof is of similar construction. which is fire and water proof A door is provided on each side in the middle of the car, the back end being left open for convenience in stoking the boiler A lookout is built at the front end of the car from which

point the engineers can be signalled to The front end of the car, entirely of steel, has three chambers, the two side ones being circular, open at the front and one side, in which the expellers revolve These are nine feet in diameter and three feet six thehes wide Each expeller consists of a cast iron hub upon which are formed four spiral flanges, having a pitch of about fourteen feet Riveted to thes flanges are four half inch steel plates or blades twenty two inches wide comprising a true helix upon the hub. The expellers are mounted upon each end of the shaft and overhang the pedestals the shaft ex circular chambers. On the middle of the shaft, which is eight inches in diameter, is keyed the sprocket wheel, which is connected with a similar wheel on the shaft of the engine by the steel chains. Those four parts constitute the drive gen die chamber opens to the interior of the car On the front is constructed the ness of the plos, consisting of steel plates projecting forward to the end of the apron or shovel It may be stated that the apron or shovel is attached to the bottom framing, the side plates, the interior web plates, and the expeller cham-bers, by steel angles and plates. This apron extends forward five feet beyond the center of the expellers. The nose and shovel, being firmly riveted together, present a rigid construction to engage the snow.

This powerful cylindrical snow plow has singless specially constructed. The cylindress are sitted inches disnotes with eighteen inche stroke and work under a steam pressure of 150 pounds per square inch. the maximum speed being two hundred revolutions per unitude. They are capable of developing 750 II H. and are placed as near as possible to the expellers

The state of the s

A view showing an expeller.

to shorten the drive chain. The engines exhaust into the bottom of the smoke box of the boiler through a suitable nossie similar to locomotive practice, creating a strong blast.

Mr A. Kubelka of Bushowitz in Morairu has discovered a process by means of which the softest sand-stone or limestone can be made hard. The process is the following. First, the surface of the stone must thoroughly cleaned, so as to expose the pores. Any oil or grease spots must be removed with benzine or with the alcohol flame Missing pieces must be filled up with cement mortar, using a 1 7 solution of waterup with cement mortar, using a 1 7 solution or water-glass for temporing Affer the sions is thoroughly dry, it is saturated with a solution of petash or seda waterslass in case of rain during or immediately after this operation, the stone must be again cleaned, dried, and saturated with the solution. Then follows an impregnation with molten After this impregnation rain will do no more harm as on account of the reaction of the chloride of cal-cium upon the solution of waterglass, the pores of will be filled with insoluble, hard silice of lime, while the soluble allicate of lime will be de-composed and washed out by rain. Another method of Kubelka's is to saturate the stone first with a solution of sulphate of alumina, in water, and when dry

with a solution of potash waterglass. So ury to the repetition of this process will be necessary to thoroughly dill all the pores of the stone. It is esough if the stone is saturated to a dapth of about \$\overline{k}\$ into Milliah brank marks may be cleased either by rubbing with a piece of the same stone, or by reflecting the stone, or by resulting with sets branks. Should the solution not impregnate the stone quick second; it must be difficult with more waiter. The scription of the solution is much be directly with more waiter. The scription of the stone minute. Whatever he left over on the surface as the this time should be wind over you the surface as the this time should be wind over your window.

one minute. Whatever is left over on the surface after this time should be wiped wary with a rag, as the crystals formed by the evaporation of the water would make a rubbing and cleaning of the stone necessary. A separate brush should be need for each solution, so that the reaction should begin in the power of the stone. For larger surfaces atomisers or

sions. For larger surfaces atomisers or sprinklers may be used aucosatelly. Through these processes any soft lines actons or sendations may be made more compact and hard Their procusates and imperiousness will equal that of the hardest stone. After treatment they may be polished and cut The great advantages of the surface and the surface and the promisent quantities of the hardest atomisms. The product of the product of the hardest stone and the surface and the promisent qualities of the harder stones. harder stones.

Mortar and concrete may also be hardened and compacted by these processes, so that they may be used with greater success in works calling for water-tightness, as water orks, tanks, street pavements, sidewalks, artificial stone, cement blocks, etc

Monuments can also be protected by these processes from the influence of the weather

of Removing Hair f

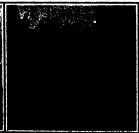
An article in the Ledertechnische Rund-schau mentions, without describing in de-tail, a new process for the rumoval of hair from hides, tail, a new process for the runoval of hair from hide pur jow with the segment commonly semployed for this pur pose (lime, sodium sulphide, etc.) are replaced by "suitable gas," which effects the runoval of the hair in from two to sight hours. The process is said to be sopically valuable for the preparation of colored latther and fine leather in general, as the product is and or very uniform grain and free from the spots which et very uniform grain and free from the apots which are often produced by lime and sodium sulphide. The leather is also much closer, tougher, stronger, and more floxible than leather made by the usual methods. Hides treated by the new account. more floxible than leather made by the usual methods. Hides treated by the new process may be tanned with bark, astract, or chrome alum. The inventor, whose address may be obtained from the journal quoted, will furnish detailed information to persons interested.

The Coming Accountle Show at Boston.

The first Accountic Show to be held in the United States without connection with any other exhibition, will open in Mechanics Building, Boston, Mass., on February 18th, and not on the 33rd, as announced in our last issue. This show will remain open one week, see enteen full-sized aeroplanes have already been sed, and the exhibition promises to be a represe tive one as far as the heavier-in-near machines are concerned The manager can be addressed at 5 Park Square, Boston, by any experimenters having machines







The plow in operation.

Front view of plots.

Plow withdrawn to show haters of set.



# BERNARD PALISSY, THE FAMOUS FRENCH POTTER, AND HIS WORKS

BY CHARLES A BRASSLER

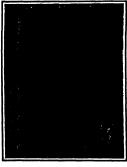


Bernard Palissy, whose statue by Barrias appropriately graces the court yard of the Ceramic Museum at Beyres, is one of the most interesting figures in his-

Bors about 139, near Ages, now in the dopartment of Lot and Gromon, France, he was appreciated early in life to a potter, and interested himself greatly in the technique of his calling, particularly in the possibilities of the various materials. He traveled in France and Germany, keeping this object to view and stedying, for this purpose, geology and natural his reasons are proposed in the control of the state of the

An enameled cup of fainnce which came into his hands inspired him with the determination to discover a method of producing white namen, and for marry sixteen years, neglecting aimone cerepthing else, he devoted his time and attention to investigations and experiments in this direction. During this period, doubtless, he made the discoveries as to colorings, giazes, etc., that that the forentiation for his future success. His first attempts were unauccessful, but he pursued his researches with unparalleled persistence and energy, ascrificing everything to what was then considered more or less of a chimers, and to what brought him only north. He exhausted all his resources, and kinding fresh for the firing of his kind,

was reduced to the necessity of burning piece by piece his household furniture. Ridiculed by his neigh



Portrait of Pallmy. From an old French miniature on volume at Cluny.

bors, bitterly reproached by his wife and tormented by the cries of his bungry children, he nevertheless persevered until finally, when reduced to the last despersite extremities, success rewarded his efforts. Unlike most of the investigators and experimental

Unities most of the investigators and experimental sits of his time, Pallary had conducted his labors systematically, and when he attained his object, he was able to repeat his work and obtain the same results A few vessels, ornamented with life-like represents those of registers, insects and small animals and colored true to nature, were a rerelation to the occurs that of those times and brought prices that soon as abled him to forget the hardships through which he had fought his way to sucress. He contiluted and perhad to the second of the

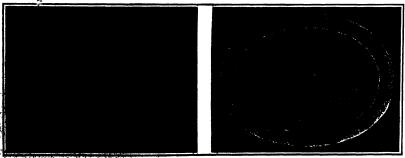
nois, for Paulary had considered the reformed faith and a man of studiests shalls and keen intelligence to substitute for the fables and fancital theories of so-called philosophers, hard facis, that were capable of practical demonstration. In 1875 he commenced the followery of a course of levtures on natural hadden of practical demonstration. In 1875 he commenced the officers of a course of levtures on natural hadden of the origin of springs, the formation of atoms and fossil shells, and advanced theories as to the best methods of practical properties of the processing of the proce



A cup and pitcher made by Bernard Palifny and new preserved in the Leuvre.

Palisay's reproduction in pottery of one of Briot's masterpieces. The Temperentia plate.

Pitcher belonging to the famous Temperentia basis and two candiesticks, all in the Louvre.



Large parties emballidad with regules, Schon and shells made by

"La Belle Jardiniere," a famous plate by Palitay preserved in the Cluny Museum.

MINISTED PARTIES, THE PARCUS PRINCE POTTER, AND HIS WORKS.

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## THE REAVERS IN PERSONNY, 1919



IRST among the astronomical discoveries of 1910 is that of a brilliant comet reported from South Africa on the 17th of January

At that time it was but five degrees south of the sun, but it was so bright that it was visible in full daylight to the unaide eye, and observations of its spec-trum, made next day at the Lick

Observatory, showed the sodium lines bright on a continuous background- thus proving that the comet was very hot and self luminous.

This doubtless means that it was then very near

the sun, and strongly heated by its radiation

From the scanty information which is yet avail it appears that the comet is moving rapidly north. eastward and diminishing in brightness. has been computed and ephemeris will be found on page 123 of this issue. It is probable that it will be visible for a few weeks in the evening sky, just after sunset, and almost directly above the point where the sun disappears. It is, however, quite possible that it may

lose so much in bright ness, as it retreats from the sun that it will not be very conspicuous On the other hand it may be a fine object, and the eve-ning skies will be well worth watching especially about the leginning of February when moonlight no longer drowns out faint objects.

Halley's comet is still visible in the ovening sky and is very slowly increaswill probably be too faint for the naked eye, though porhana visible in a field

It will fortunately be casy to locate Just north of the planet Saturn are three stars of the fou magnitude, in an east and west line On February 5th the comet will be about 50 min of arc (or, roughly, one and a half times the moon's diameter) north of the middle one of these stars, and on the 17th it will be about the same distance north of the westernment of the three line of By following this line of motion it can

By the end of the month it will be pretty low in the west at sunset, and soon after it will ganish in the twilight, to reappear, much brighter, in the much brighter, in morning sky in April

While the appear these comets is exciting so much interest, a notable

the explanation of these phenomens. Observations of the spectra of the last two bright comets (Daniel's and chouses) showed that the light of the tail con et entirely of bright bands, given out by But at that time no gas was me lumin ous grus. some luminous gas. But at that time no gas was known which gave just these bands. Very recently Mr Fowler of South Kensington, England, has found that a vacuum tube, centaining small quantities of nitrogen, and of carbon compounds (excited electrically so as to glow), shows a spectrum exactly like that of the comet's talls, provided the pressure of the gas is made exceedingly small

As the pressure and density of the gas to a come's tail must be almost incalculably less than in any vacuum which we can produce by mechanical means, this gives us a satisfactor explanation of the observa-tions. The luminous particles though so thinly distributed through space, are molecules of familian gases, and one of the mysteries which surround comets has been cleared away

THE REAVENS
The splendid and familiar winter constellations are

en in all their glory

Due south and about half way up the sky is Orion The very bright star below him to the left is Sirius. West of this, directly below Orion, are the small groups

or Missouri can see a star of excep This is Canopus, the principal star of the great con stellation Argo, and, next to Sirius, the brightest in the heavens. This star's brightness might make us anticipate that, like Strius, it might be a near neigh

nousand fold in brightness.

To the left of Orion and Taurus are Canis Mi and Gemini, and right overhead is Auriga, with the bright star Capella. In the southwest there is noth bright star Capella.

ing of much interest, but in the west we see two bright objects, one above the other, not marked on the map These are the planets, Mars and Saturn, whose motion

of the Hare and the Dove. Far below the latter, othern horizon those who live south of Virginia tional brightness anticipate cust, ilse birtus, it migat on a hear saign bor of ours in pages, but repeated and careful observa-tions show that this is not so Its distance is too great to measure accurately, but it is at least ten times as far off as Sirius, and probably much farther from us. Canopus must therefore be really a most magnificent luminary, exceeding our sun at least a

These are ine planets, Mara and Saturn, whose motion among the sizar nakes it impossible to put them in our permanent maps of the heavens. Mars is higher up than Saturn, and is redder in color. In the northwest we see Andromeda and Cassiopeia, and above them Perseus. This is another of the constillations which bears no real resemblance to any

. At 9 o'clock Prin. 6: At 9% o'clock: Prin. 50 At 8 o'clock: Prin. 50. At \$14 o'clock Tomogr St.

MIGHT SKY: JAMUARY AND PERPUARY

thing in particular, but with the aid of the drawing in our initial it is possible to see how the ancients found here the figure of the hero carrying the head of the Gorgon Medusa, which is marked by the bright star Algol

star Agol
The bright spot in the Milky Way, between Perseus
and Cassiopeis, is a spiendid star cluster, showing well
in the smallest telescopes.
To see how the northern constellations appear in

the sky, we must turn our map upside down, so that the words "Northern Horison" are at the bottom. It the words "Northern Horston" are at the botton. It will then appear that Cophous is below the Pols, on the left. The Little Near hangs by its tail from the control of the second of the

THE PLANSES.

Mercury is morning star throughout the m is unfavorably placed south of the sun. He may be best seen about the 20th, when he rises about 5-40 A. M. Venus is evening star until the 12th, when she passes between us and the sun and becomes a morning star.
At the beginning of the month she is easily visible in
the evening, setting more than an heur sad a half
later than the sun, and at its end she is similarly acous in the morning skies.

spicoses in the morning axiss.

During the middle of February she will be invisible
to the naked eye, but as she passes almost 8 degrees
morth of the sun, she should be observable telescopi-cally, in full daylight, as a thin orescent, all through

Mars is evening star in Aries, remaining in sight

stars is evening star in Aries, remaining in sight till mearly middight. Jupiter is in Virgo, rising about 10 50 P M, at the beginning of the month, and 8 10 at its close. Seturn is evening star in Pisces, setting about 10 P M in the middle of the month. Uwanus rises only about 1% hours before the sun, and is undewrable.

Neptune is in Gemini, observable all the evening, but only with a good-sized telescope.

THE MOON

Last quarter occurs at 6 A. M on the 2nd, new moon at 8. P M on the 9th, first quarter at 10 P M on the 17th, and full moon at 8 P M on the 23rd. The moon 17th, and full moon at 3 P M on the 23rd. The moon at 28 P M on the 28th. Bhe is in conjunction with Urahus and Merical Merica

Jupiter on the 27th Princeton University Ob-

servatory

# The Library of the Amyrian King, Sardananales

During the interval of the past fifty years twenty thousand stone tablets, ap-proximately, of the library of the Assyrian king. Be danapalus, were found in the course of excavations among the ruins of Nine-veh and taken to London The texts written on them, which are related to one another apparently, are now published in their original considerm script by the British Museum in savants of the whole world have therefore an oppor tunity for further investi n of the texts their special province, for every kind of text in cuneiform script presents its own particular difficulties translator and com mentator In the four-teenth collection, or vol-ume of the work are as-sembled those tablets of sembled those tablets of the king's library which regard chiefly the objects of the three natural king doms. Obviously many of for purposes of medica

For this reason a proinent physician, Baron Oefele, assisted by noted

scholars in cunoiform acript among them Prof Einmern of Leipzig, began actifs among them Prof Himmers of Lalysig, beam to examine this collection with a degree of sail that has become quite profile. Apart from the many lists which mention minerals, the numerous intex of sailmain which mention minerals, the sailman collection and the are arranged in two collumin, the same names being given in the first column in Humerian and in the sec-ond column in Accouldan, that is, in Balylonian Bill, for more interesting than the monopiral lists are the locanical lists, of which there is a given number, and profiles the profiles of the sail of the sail of the sail of the profiles by the sail of the sail which give the most various directions to acquality the ampling physician with the effect and use of hundreds of medicinal plants. This fact may suffice to show that among the old Babylonians the knowledge of the natural sciences was already for greater than among their successors, the Greeks and Romans, whose manuse of animals and plants, it is manifest, have be rived partly from the Babylonian language.

The shortest track for steamers from Panaina 25 Yokobama, Shanghai, and Hongkong points in done proximity to San Lutena Bay, says Cape San Lesian, as the southern and of Lower Chilifornia, and to the ports of Manzanfillo and Acapulco on the mainland of ports of Manzanillo and Acapulco on the mai Mexico. Perhaps Mansanillo should be rest

# Scientific American



#### MRTHOD OF ECONOMISING GAS. NY A J JARNAN

How to economise the consumption of gas for illumitating and heating purposes in a question of consider able importance to-day. The price charged for coal gas

at the present time many towns and cities is so high as to prevent its use for cooling pur poses. Only b exercis-ing the utmost econ ing the utmost econ omy in using only just enough to rook the small quantity of food required does the use of gas for cooking become advantageous under such conditions.



SECTION OF THE SAS MIZING APPARATUS

By means of a simple apparatus the heating qualities of the gas can be improved so as to reduce cooking ex penses and the cost of lighting as well, for in Welsbach and kindred

lamps it is the heat of the burning gas that renders the mantle brilliantly incandescent Moreover the the mantie brilliantly incandescent Moreover the lighting qualities of the gas are greatly improved as well. The following apparatus, which was first made by the writer in 1872, has been put to the test in hundreds of cases and has proved its efficiency in every instance. Any man who is handy in the use of metal working tools can make one and fit it to suit his gas supply by attaching it to the supply pipe after the gas has passed the meter, the gas then belongs

the gas has passed the meter, the gas then belongs to the consumer, it being the property of the gas company before it passes the mater. The apparatus here described is suitable for a ten light meter, with all the fittings for lighting, heating and coaking it consists of a closed the cylinder A six inches in diameter and seven inches high without he control to Whitn this vessel is placed another cylinder made of gaivantsed wire netting, with a half-light high property of the control to the contro inch mesh the diameter being four in hes and height seven inches This wire cylinder is placed within the tin case, having a one-inch space all round Within pace clean, white cotton waste is packed. A tin ler C six and a half inches long and three and cylinder C six and a hair in these long and three and non-hair linches dismoster is soldered all round to the cone top of the cylinder A and is provided with a perfect of the cylinder A and is provided with a perfect of the cylinder A and is soldered by the cylinder and the saturates the rection waste D. The cylinder C at the saturates the rection waste D. The cylinder C at the approach C and the cylinder C at the approach C and C and C are the cylinder and then passe out through plue F. The apparatus is charged with besults, greatened, or a similar valuatile hydrocarbon core as follows: benaine, graodine, or a similar volatile hydrocarbon capable of being taken up by the nonliluminating constituents of coal gas, such as hydrogen, marsh gas or carbonic oxide At G is a suitable braza stop-cock which canables one to turn off the gas when charging



A 100-LIBER AND A SALISHY GAS BOOKSWIKER

the apparatus with gaseline. The brass cap at B must have a filth of plishle bastlers fitted in the interior so that it becomes periodicy gate-light value across down. It is necessary to make a hole in the supply ripe B at B so that it case the gaseline should cover the bettem of the inity type this would prevent say fishering of the light B to babiling of the sus through the light B.

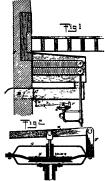
The charging of the apparatus must be carried out in daylight, and it should be fitted near a window where daylight is admitted, for a lighted match, candle or lamp must not be used With these simple precau-tions the apparatus is perfectly safe. The cone top or lamp must not be used. With these simple pressus times the apparatus is parfectly selected where the tim criticol must be perfectly soldered where the tim criticol mest, and all the brane connections attached to the inlet and outlet pipes must also be perfectly soldered inflar nulsber piping or consectives must not be used soldered connections, must be used. When the economittee is fitted and charged with about three pints of gasoline it will be found that the intensity of light from an It will be found that the intensity of light from an ordinary naked burner will be vastly improved
It has been found that half a gallon of benxine will

take the place of 500 cubic feet for direct illumination in this apparatus

The cotton waste in the economizer must be nacked The cotton waste in the economistr must be packed moderately light. If packed too loose it will sink and give less surface for the gas to reach the gasoline. Bo sure and mark the outer end of the inlet pipe IN This will prevent any mistake when installing the

## REGULATOR FOR INDIRECT AND DIRECT-INDIRECT STRAW HEATING NY 8 4 30

Every indirect and direct indirect steam heater ld have some kind of a regulator so as to shut off the air supply when there is no heat in the radiator, otherwise, especially at night when the steam pressure goes down and the air box remains open with the



REGULATOR FOR INDIRECT STEAM MEATING

cold wind blowing directly into it, it will soon rool off

The accompanying illustrations show a very simple way to make such a regulator Fig 1 shows the gen eral arrangement of an indirect heating radiator, and ig 2 shows in detail the regulator

The radiator A is inclosed in a box in the usual way The radiator A is inclosed in a box in the usual way king its air from the outside torough the passance B and having a shutter or damper C mounted to turn in unliable bearings on a shaft. The latter has a small bell crank D secured to its outer and which through a link is connected to a lever B. The lever B is pivoted in suitable brackets P fastened to the regulator Or be regulator on the major of two small frying pass ets say about 6 inches in diameter. A part of the conical rim is bent outward forming flanges for boiling the same together. The bending is done very easily. Place the skillet over the edge of an iron block, and with a flat peen hammer stretch the edge, say and with a flat peen hammer affector fine dogs, say about \$\frac{1}{2}\$ inch all around To the lower head, rivet a small floor flange, which will serve for connection with the steamplip from the boiler. In the center of the upper head a hole is made large enough to re-ceive a half inch nipple. To the lever is featened a short not which passes down through this nipple to the disphrarm H

the displayment H
The displayment is made of sheet rubber, say 3/16
tanh thick with one or more layers of duck in it. The
top and bottom disks of iron with bereided adder
about it, inch thick are riveted. To the upper disk is
soldered a half inch implies or player of play, service
as graded to the service of the service of the
top of the service of the service of the service of the
The whole is now placed between the two
The the lower hand is formated the service of the service of

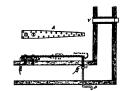
To the lower head is fastened the usual siphon pip te prevent the steam from othering the regulator A the steam pressure rises it will force the disphragm upward, thereby opening the shutter  $\sigma$  in the air passage B, permitting the cold air to pass under and through the bank of radiators, thereby heating them thence up through the register into the room and will keep it open until the steam pressure goes down. The weight of the arm E will then close the shutter per mitting no more air to pass until again opened by the steam pressure. A weight may be attached to this lever, so as to close the shutter more effectually

## THERMOSTATIC ALARM FOR HOUSE REATERS

The accompanying diagram shows how a simple arm for house heaters can be made.

The object of this alarm is to give warning when

the furnace is overheated and needs attention, or when the fire is nearly out and needs more coal. A there static bar A 11/2 inches by 1/16-inch is made



THERMOSTATIC ALARM FOR HOUSE HEATERS

and from riveted together very closely and fastened at one end are brackets B which are secured to a suitable base B. The free end of the bar A moves between two contact points D made of ordinary acreways. These are screwed into posts C made of ½ inch dowel

and secure d to the base H

The whole is fastened in an inverted position over
the furnace or other place where there is danger of over heating After the contact points are adjusted to close the circuit at the proper temperature they are con nected up to an electric bell and battery as indicated in the drawing

A switch is placed in the circuit at some convenient A switch is placed in the circuit at some convenient point. It will now be seen that when the thermostatic bar B moves to either aide according to the tempera-ture and makes connections with contact points D the bell E will ring. When the apparatus gives the neces-sary alarm, the switch must be turned off until the trouble is remedied

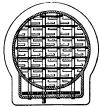
ADAPTING A GRATE FOR SHALL COAL.

BY J. A DEBUSTRON

The grates in the ordinary bouse heating furnaces

are regulated and made for the best and most suitable
size of coal to be used in each particular case. That is to say in a large hot-air furnace where egg coal is most suitable, a very coarse and open grate is pro-vided but in a smaller furnace where smaller coal is e used, a much closer grate is furnished

In some localities where pea coal is much cheaper than egg stove or nut it would perhaps be more eco-nomical to burn the pea coal provided the grate would permit As a rule, if the pts coal is used in these large furnaces it has not proved very successful on account of the coarse grate, unless a new one is put in more suitable for the smaller coal as the shaking of



STATE ADAPTED FOR BURNING SMALL COAL

the old grate will cause the whole fire to dump into the

To overcome this the writer has tried several meth

of and has come to the conclusion that the best is that shown in the accompanying illustration. The grate is an ordinary rocking floger grate. Between every or every other floger (which will die pad upon the kind of grate and also of the size of coal to

be used) is placed across the entire grate a piece of say ½ inch pipe or bar. These pipes or bars rest on the grate bars and are not affected by the rocking of the grate. As the sames acroundate on top of these bars they have a tendency to keep them in place and will prevent them from moving or burning

There should always be a layer of an inch or two of sahes on any grate. Care should be taken not to shake the grate too much, as a great deal of live coal will fall through and sometimes start to burn in the

shake the grate too much, as a great deal or tive coat will fail through and sometimes start to burn in the sah pit thereby warping and destroying the grate bars. The writer has used some old pipes and grate bars for a number of years and to-day they are as good as Some years ago, during the coal famine, a great deal of bituminous coal was burned with perfect success It is best when starting a new fire to clean out the ash pit and if any live coals fall through they may be showled up on the fire sgata until enough ashes are formed to prevent them from falling through

## HOW TO BURN COAL ECONOMICALLY

The accompanying illustrations show how in a very simple way the gases in an ordinary furnace may be simple way the gases in an ordinary furnace may be consumed and burned thereby giving off a more uni-form heat and maintaining an even temperature throughout the house continuously night and day It will effect a saving on the coal bis and produce more

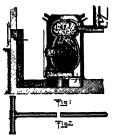
The fire in a stove or furnace is simply the result of a chemical union of the carbon properties of the fuel both solid and gaseous, with the oxygen of the alr

By the complete combustion of one pound of coal 14,600 heat units are given off, but by the incomplete combustion of one pound of coal, as burned in the great majority of domestic heaters, only about 4,000 to 5,000 heat units are produced and the balance of the heat passes away up the chimney a rich combustible gas that should have burned

tain the highest efficiency from coal it must be burned with the least possible supply of air con sistent with perfect combustion, as an excess of air carries the heat of the fuel into the chimney and a carries the neat of the the linto the chimney and a certain influture of air from below the grate will cause an explosion in the smoke pipe blowing the fire door open and filling the cellar with spint gases Nearly every furnace discharges see alled "coal gas

which is due either to poor draft or a defective fur nace, or an improper adjustment of the dampers. As the odor is so noticeable, the difficulty is soon reme died Every furnace however, is constantly discharg ing more or less carbon monoxide gas which is per fectly odorless and is a very energetic poison, as the of Imperfect combustion

Ordinarily the domestic user of coal roasts out the gas, opens the dampers and drives it up the chimney and then proceeds to burn the coke, which is only shout one-half of the heat value of the coal, besides it is not alone the heat that escapes up the chimney, but the rich combustible gas that passes away uncon sumed. This gas when burned produces a uniformly



ARRANGEMENT FOR BURNING THE GAMES OF THE

higher temperature than the coal lizelf, which may burn at varying temperatures even so low as to pro-

dues but little heat

The clinkers that form in the furnace are the result of an excessive draft below the grate

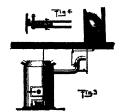
To accomplish the mixing of the hot gases and air

the air must be heated to the same temperature.

The most common domestic heating furnace is the bot-air furnace. This is simply an improved stove in-closed in a sheet iron or brick casing. The furnace cats the air within this inclosure to a, high tempera

tin pipes. To keep this current of hot air rising, a with the outside air and is regulated with a damper This cold-air box should always be kept open as much as possible and never entirely closed while there is the furnace, as the furnace will beco heated and may be injured.

Fig 1 shows how the common hot-air furnace may be adapted to burn the gas of the coal A small pipe, be anapted to ourn the gas or ins cost a same pur-may I inch or 1½ inch is inserted through the upper part of the smoke pipe (as the gases here are the hot-test), terminating in close proximity to the smoke collar just inside of the radiator of the store. inner end may be fitted with a suitable spreader, such as shown in detail in Fig 3 The cross pipes have a number of 3/16-inch holes drilled in the lower side, or



HAND METHOD OF PROSTATING THE DAMPERS

facing downward. The outer end of the pipe is fitte with some kind of a damper to regulate the supply of air. As the cold air passes through this pipe it be-comes heated and at its delivery end is of the same temperature as the games, but as the specific gravity of this beated air is much greater than that of the gases in the furnace, it drops down and mixes with the gases forming a combustible mixture which now burns with a blue fame, just as in an ordinary gas stove if a small place of mica is inserted into the fire door this burning may be observed. It is a very

iteresting phonomenon In order to make the system a success the fire pot must be in perfect condition, that is to say, in a hot air furnace there should be no communication betw air furnace there should be no communication between the fire pot and the air chamber, no cracks and no loose joints. The fire door should be as air-tight as possible. This may be made tight in the following manner. First, file and remove all rout at the edge of the door until a motalitic surface suppears, then out a harrow strip of ascession and seak in salt water, after with place it around the door and it will ashere. Put a litie oil on the door frame and close the door The asbestos will then fill up any opening and bake very hard on the door

hard on the door if everything below the grain were absolutely atritich to combustion would take place, but as all formaces leak more or less this leakage is enough to support combustion in ordinary weather in extremely cold weather, however, the alide in the sab pit door may be opened a little, so as to furnish a little more air

A damper is attached to the smoke pipe above the air pipe, so that when open it will not cool off the air

A fire is built in the furnace the ordinary way, keep the air damper closed until a good fire is obtained, then put on some coal and keep the lower damper open for a few minutes, after which close all drafts and open the air damper, regulate the same according to the heat required, that is to say, more heat, more air Through the before-mentioned mica window ob-serve the results. All the gases in the furnace will, however, not burn, as some are bound to escape un however, not burn, as son

There is more economy in running a large, slow fire all day long than a hot one at intervals. There fore it is best to coal the fire twice a day, in the morn ing and at night, and regulate it so that the fire burns with an even temperature. It will keep the house at a

with an oven temperature. It will keep the house at a uniform temperature slight and day.
When the furnace has been cooled for the day of the night the dampers may be controlled from any room above by simply relating or lowering a lever con-nected with vehice ranking over pulleys to the various dampers, thereby saving many a step. This is above in Fig. 2, a sectional plan of the levers is shown in Fig. 2, a sectional plan of the levers is shown in

Fig 4
In ordinary weather the fire should only be shaken
the morning, but in very once a day, preferably in the movining, but in very mild weather twice a week will suffice. Only shake until the first red coal comes down. In furnaces with very strong drafts shake but very little, as the layer of ashes on top of the grate will help check the draft. If the first is very low stick a law pieces of kinding wood into the fire. This will heat up the smalle the The ambuit door may also be opened until the fire drawn up, then regulate as before described.

With this arrangement in good working or rticle of coal will burn to an ash. al, of course, will not burn.

This applies to all three heating sys unus appues to au three neating systems in equipalities, namely, hot air, hot water, and steam, as it only takes care of the fire.

In hot-air heating, in addition to regulating the fire

In hotair heating, in addition to regularing the my the cold-air box must be regulated. This box generally by terminates outside the building under a porch. If has always been a source of annoyance because of changes in the direction of the wind. Sometimes the changes in the direction of the wine. Sometimes use wind will blow directly into it and cool off the house, but when the wind is in another direction it will such the hot air out from the furnace info the atmosphers To overcome this a shield is placed in front of the box, say 8 inches from the building, overlapping about 12 to 18 inches all around Then it will be impossible for the wind to interfere with the regulation of the six, which is generally done in the cellar with a damper or shutter

or shuter

The pipes in the cellar leading to the regis
ahould be kept clean, also the registers Avoid
ting any wire netting to catch articles dropped ther
as it will catch more dirt than anything else, so d put

as it will catch more dirt tan anything eise, some-times clogging up the meshes completely, forming an excellent breeding place for bacteria.

The water pan should be connected with the water supply, controlled by a fixet valve. This insures an even water level in the furnace

even water level in the rurance.

In steam heating plants the boller and radiators should be large enough to keep the house at a temperature of 70 deg in zero weather with one pound of steam, as this will take a great deal less coal than when the boiler and radiators are too small, and require a steam pressure of 10 to 20 pounds

In houses where the draft is good one day and poor the next, despite favorable winds, the fault is with the chimney It should be built higher This is a great deal cheaper and better than to put an unsightly cap on it

#### HOME-WADE ASK SIFTED BY J A BROPWY

A dustless at hifter can be made at a very small expenditure of money by following the lines of the secondarying driving Make a box A shaped as above a comparing driving Make a box A shaped as above 1 to love the property of the secondary of th

Then make a frame C of 1 inch wide stock, 1 is narrower than the inside width of box and 1 inch shorter than the inside length of the box Bore a 2-inch hole in the center of one end of this frame and cover the frame with \( \frac{1}{2} \)-inth mosh galvanised netting. Inclose three sides of this frame with thin board about 5 inches high, tapering the two aides, as shown.



SECTIONAL VIEW OF THE WOMENAND ARM STOPES.

and leaving the discharge and open, which should be and leaving the discharge and open, which should be hinged to frost end of box with two if by S-inch hinges. Put a piece of rope through a hole in the upper end of rame and fasten it not up so that it will not pull out. The box is now ready for the top which has a hinged door D, as shown. On tips of box places a palley and run the rope through the hole in the top of the box

run the rope through the hole in the top of the best and over the pulley wheel. The seed of this rope have a large ring stacehol to it as shawn. This arrangement will allow the sifting frame to be swung up and down, jarring the fruits every time it strikes the block? I fustened to run of the box. Over the opening in frent of the form.

Over the opining in frent of box faston a bapeleaped collect to gridle the dishiper to a notable recognised and

cloth to guide the consparer so to prevent dust from rising.

This offers has prevent very class and door not so onice a necessir shoresting of pitted below.

#### ENGRAPHY PATRETED INVESTIGES. to Apparel

Fernaning to Apparel.
BUTION—A Term, Rillstore, N D This
hwatthen refers particularly to means of attaching bettoms to garments and the life. The
object is to produce a button having a realiset
or extensible shank of improved construction,
which will yield or give under strain so as to
relieve the strain to which the attaching
stitching or cord is subject.

#### Electrical Devices

BEAUTICAL DEVICES.

BYARKING DEVICE.—1 W GILSS, New Bedford, and C W Tosar, Fairhaven, Mass. An object of the imporvement is to provide a circuit breaker so an induction coil which will give one large park instead of a succession of sparks, such as those produced by the ordinary forms of bivaries Means are provided by which the core of the cell may be theroughly magnitude before the break occurs.

Of Interest to Farmers,
COVERED RURN DOOR TRACK AND
HANGER—E F MORRIES, Cogges, Jown The
principal objects which the present invention
has in vive are to provide a device for hasping siding doors, which is fully protected from
rate and snow, and to provide a device which
is simplified in construction and arranged to
present the installation thereof by as multilated

removal of water from the dam being employed, to presid an example to be sude in the soil then exposed.

MARMER SCHLESTER - Fram. Creation, NY MARMER SCHLESTER - Fram. Creation, NY MARMER SCHLESTER - Fram. Creation, NY MARMER SCHLESTER - Fram. Creation and movable forwardly and rearwardly, and means are provided for positively locking the sunt in processive positions against turnbur work and not provided for positively locking the sunt in processive positions against turnbur work and not provided processing both the soil processing the sunt and the sunt provided processing the sunt and the sunt processing the sunt proc

may discharge the contents of the bottle by marely pressing upon a knob. When the press-ure is relaxed the bottle is closed automatic ally

ally POST FORMING MOLD—W W RAILEY, Chadwick, Ill This invention consists of a post forming device or moist which will permit of a post being formed in a concept was consistent to the post of the post of the post of the post of the post was consistent to the post will be of the moid will cause a traveling action and produce a asporti failab to the sides of the finished post.

# Hardware and Tools.

thorough manner. It relates to a rotary press size made for lubricating both the that forces the material to pass through a the wheats.

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Norse—(oples of any of these patents will be furnished by Munn & to for ten cents such Please state the name of the patents—(the of the invention, and date of this paper



Kindly write queries on separate sheets when writing about other matters, such as parcents, subscriptions house, each This will facilities assured my root questions. For such as the same and address on very sheet. Full hints correspondent were princed at the bead of this column in the issue of March 18th or will be sent by mail on request.

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# INDEX OF INVENTIONS

For which Letters Patent of the United States were issued for the Week Ending January 25, 1910.

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Its Manufacture and Uses

By JOHN K. BRACHVOGEL, M.E.

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## SPARK COILS Their Construction Simply Explained

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pictibling and wheatric trubbs. So far they
have fulled to develop any serious difficultion. It took the utmost patience on the

larm hilds to sevent may serious although the time, it that the utmost patience dit the part of Mr. Beison to develop the being to a state which he now considers practically "non-proof." Nationally being the state of the state of the state of the problem as not been so patient and has represented by the state of the all superfluous weight be eliminated. The question of weight is not so vital a mat question of weight is not so vital a mat-ter in the ordinary street car and has never received a great deal of attention. Mr Raight A. Beach, who has been Mr Edison's assistant in adapting the storage battery to traction, was called upon to build a special car that would be as light as possible. He found that the common street car is marely a small car at the care that the street car is merely a smaller and alightly modified steam railroad car, and it was modified attemn realities cas, and it was necessary for him to branch out on en-tirely new lines. He guarded as jealously against unnecessary weight as the builder of an aeroplane. The backbone of the car of an aeropiane The backbone of the car-he wolved consists of two 18-foot lattice girders which extand the entire length of the body under the ser's They consist of electrically welded steel bars and are so inficialise that when loaded with two tons at the center they show a defection of the 18-foot of t of but 3/1000 of an inch Around these two girders the car is built. In the first place they form a cash built in the first place they form a cashing to receive the batteries of which there are 210 cells, 100-on each side for power and 10 for light-ing All the superstructure of the car is built of veneer and light woodwork with the exception of the strap rails and posts, which are of bicycle tubing and act as a framework to support the weight of the roof. The roof itself consists of a single sheet of veneer bent to the preper form, and is so light as to pe form, and is so light as to permit of making the side poets much smaller than in the ordinary car. The fact that this car does not have to support a trolley pole has allowed of using so light a roof.

The truck contains many novel feat-ires. The connection between the truck and body is such as to permit of a side and end movement of but 1/4 of an inch. although it may move vertically to a although it may move vertically to a much greater degree The object of this is to insure smooth running and to pre-vent the usual swaying. In place of the usual car wheels light steel wheels are used. The axles are divided at the centur, being connected by long sleeves which permit one wheel to gain upon its mate when rounding curves or in case of a slight difference in their diameter. In this arrangement will be seen the influ-ence of the automobile. There are other features as well which remind one of the automobile and show a radical departure from the common car construc-

tion in place of genting the motors directly to the wheels a silent chain drive directly to the wheels a silent chain drive is used which, as automobile practice has shown, furnishes a more comomical trans-mission owing to the fact that a large part of the sprocket wheels is in mesh part of the sprocket wheels is In meals with the chair, whereas in the spur gaar transmission only one tooth, or at most, three teeth of the pinde, oit, all sunges the teeth of the gear. Furthermore the chair drive parmits of a greater for a reduction. Commonty a 2 to 1 reduction is the most used on railway cars, whereas on the storage battery our a reduction of the form of the storage battery our a reduction of the latest the storage battery our, a reduction of it is employed. This permits of stding lighter motors, and hence forms one of the batter state. I confirm the control of the control

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(Continued from page 132.)
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> ARTIFICIAL PRODUCTION OF THE VOICE. (Concluded from page 120) emitted by the laryux were recorded by a

phonograph The following conclusion were reached When the larynx of a dog is remove during chloroform ansethesia, the lar yngeal muscles retain their ability to con tract for a short period, which varies from 3 to 10 minutes, but no contraction can be produced in the muscles of a dead even if it is removed immediately the arterial blood has escaped in order to arterial blood has escaped. In order to produce the vibrations the current of air should be impalled by a pressure of from 6 to 8 inches of water as it is to be pressured. is in the normal production of the bu In these conditions the excised larynx of the dog barks and howls in every note of the canina register from the deep baying of a mastiff to the shrill pipe of a terrier These various notes pipe of a terrier These various notes are obtained at will by causing various muscles to contract if the stimulation is confined to the muscles which connect the two arytenoid cartilages (two small cartilages at the back of the larynx to which the posterior ends of the vocal cords are attached) these cartilages approach each other and a deep tone is produced if on the other hand, the stimulation is extended to the muscles which connect the arytenoid cartilage, with the thyroid cartilage (the large V shaped cartilage at the front of the lar ynx, constituting the 'Adam's apple,' to which the anterior ends of the vocal cords are attached) the vocal cords are contracted and a high, shrill note re

dependent of the pressure of the air and the strength of the electric current, and to be determined solely by the part of the muscular system of the larynx to which the stimulation is applied. The whole larynz, including the glotts and the epiglottia, changes its form with every change in pitch. Hence the larynx various notes by changing its form and

These (xperiments, in addition to their scientific interest, explain the purely scientific interest, explain the sudden loss of voice to which singers and public speakers are often subject. The loss of voice has nothing to do with the vocal cords, but is caused by a sudden contraction of some of the muscles which ontrol the glottle and is analogous the rheumatic and neuralsic pains which body

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search has proved to be correct. He was arrested as a horotic in 1588 and im mured in the Bastile, but in 1590, before

Nis case had been disposed of, he died Quite a number of authentic specimens of his work are in existence, and they of his work are in existence, and they are practically as priceless in value as they are superb in execution. At the Louvre and Cluny Museums, from which our illustrations are obtained, (Concluded on page 185.)

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| MISCELLANEOUS   | tinsket for hose complings R. R. MacPwan  | 147,045<br>147 4,51   | SIMPLE WIRELESS TRLEGRAPH STUTENS<br>are described in Scientific American Supple-<br>ments 1969 and 1981   | Ratiway cuttle goard G P Wood<br>Ratiway frog and switch A L. McMaster<br>Ratiway frog and switch, J M Street   | 947 208<br>947,753   |
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| stract Co. Resourg Ore.  Inquiry No. 983N.—Wented, the address of the Chipman Restric Paritying Co.   | Grinding machine, J P Lynch<br>Grinding mill J C Bowsher  | 047 572<br>047,045<br>047 4,01<br>047 698<br>047 697<br>947 252<br>047 219<br>047 275   | THE LOCATION AND RESCRIPT OF A 186-<br>MILE WIRELESS TRIBERANG PRAYION is<br>clearly explained with the help of diagrams<br>in Scientife American Repolement 1888.   | Reliver serely switch and signal device.  | 18,079   |
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|   | that<br>Hydrauli, Jack E. A Gathmann  | 947 502<br>947,613  | Good articles on SMALL WATER MOTORS<br>are contained in Scientific American Supplement<br>1494, 1949, and 1696.  | Rope making machine, M. & H. Kjeletad   | 947 TBS<br>947 410   |
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| sagnification of the street of  | thating with self filling stell. H. Rett. Instantion with self silling stell. H. Rett. Instantion to "Indicated bery A. O. A. Martin. Here's constantion organ, y W. Brack Infragating ditches, bend gate for D. A. Rechastlywish, means for regarding ditches, bend gate for D. A. Rechastlywish, means for regarding the Himbarian of films in, D. thwoster H. Hanner, P. H. Rampy, T. J. Hanner, and H. R. Rampy, L. Rampy, L. R. Rampy, L. R. Rampy, L. R. Rampy, L. R. Rampy, L. Rampy, L. R. Rampy, L.  |   | NOW TO MAKE A TERRITORIAT IS OF  | Serving marking, T C Plent  | 해;배  |
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We produce herewith a portrait of Box pard Palisay from an old French mini-ature of his period on veilum, that is preserved at the Cluny Museum Palisay ed at the Cluny Museum oreserved at the Chuny Museum Palisay is represented, full face and in court cos-tume with ruffs. His doublet is embroid-ered and relieved with gold, the sleeves are be-ribboned, and on the chest is braid Above the head appears the inscription B. Paliesy

His works reflect alike genius and artistic taste, and his work was original, marvelously true to nature in execution and coloring, and probably in a more marked degree than any other master of the ceramic art, he learned to perfect colors that would be, after firing known quantities, a knowledge that enabled him to duplicate, with such wonderful certainty, the color effects of the fish, rep tiles, insects, etc., he loved to reproduce The extent to which his style was imi ated affords the most practical proof of the favor it enjoyed

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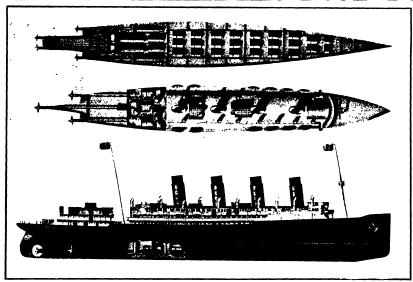


## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

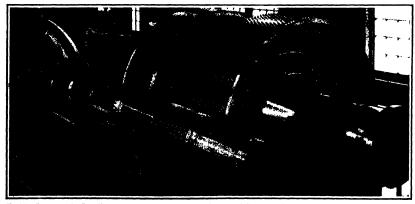
Vol. CII.-No. 7

NEW YORK, FEBRUARY 12, 1910

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The upper cograving shows the space occupied by the boliers and engines of the "Mauretania." The two lower engravings demonstrate the large saving in space resulting from the use of high-speed tarbines, driving, through reduction gears, three sistemapeed projections. They would never 1,460 tones of coal and ore of \$5.00 on each translitantic trip



The pinion, direct-connected to the turbine, runs at 1,500 revolutions per minute. The spar wheel, direct-connected to the propeller, runs at 200 revolutions per minute.

SPEED-REDUCTION GRAE—A WAY OUT OF THE MARINE TURBINE DILBERTA—[See page 142.]

### SCIENTIFIC AMERICAN ESTABLISHED 1845

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CHARLES TELEN MINK Producted all Honoray New York
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NEW YORK SAFERDAY FEBRUARY 12th, 1910

The following dwing halfs to the forexamination illustrated are authorise of simily interest. It the photographs are short the about and the facts authorise the contributions will receive a strength of Accepted article will be paid for as regular space rates.

### CANADA AND THE QUEBEC BRIDGE.

MHNERING and architectural works of tifirst magnitude are to no little degree an expression in concrete form of the character of the people by whom they are built it would be difficult to define the extent to which our impressions of the audient Greek are based upon the architecture of his noble shrines and temples or how far our respect for the later Roman is due to feats of engineering skill that would do credit to our twen tieth century civilization

Because of the skill and daring which are or seem to be involved the design and erection of bridges of numeral magnitude has ever been considered one of the most difficult, we had almost said spectacular feats of construction and the successful such structures has brought world wide fame to the in which the work was done. Thus the Forth Bridge In which the work was don. Thus the Forth Bridge stands te-day as one of the noblest menuments of con-structive engineering in the whole of the British em-pire, and a memorial to the man who was responsible for the design has recently been placed in Westmin ther Abbey So too our own beautiful and dignified Brooklyn Bridge over the East River is a lasting tribute to bridge engineering as individualized in America and the city of Trenton has recently un veiled a monument to the memory of Roebling the

velied a monument to the memory of recently the father of long span asspan used method brings interna-tional fame to the man and the people who earry great engineering works to a successful issue must, in the very nature of things throw a proportionate shadow of discredit when one of these great struc-tures falls in utter ruin and, as in the case of the quebe Bridge (arries night upon en hundred souls to destruction. This fact was frankly recognized at the time by the cogine-cing and to bink all press both in this country and in Canada, and it was realized to be a matter of national importance that when the to be a matter of national importance that when the bridge came to be rebuilt, the new structure should not only be perfectly stiff and strong but that it should embody such architectural treatment as would render it esthetically pleasing to the eye, and worthy of that great school of bridge engineering which has sprung up and flourished in the Western Hemisphere

When the Canadian government took hold of the matter and lent all its powerful prestige and financial assistance to the scheme, it was accepted as an augury that the new bridge would be worthy of the great Dominion across the border line. We have to confess Dominion across the norder inc. we have to convex flow ver that the bridge which it is now proposed to build is decidedly disappointing. The type selected and the method of treatment are not up to the latest standards of bridge engineering in other words the design is distinctly commonplace. Æsthetically it

bas not a single redeeming feature
In redesigning the bridge, the Canadian go could have made more sure of securing the hest pos-sible designs, if they had thrown the bridge open to world-wide competition. We should then have learned whether the strongest, most economical and most beautiful bridge could have been secured under the cantilever or under the suspension system of design Personally we believe that on all three counts it would be possible to produce a suspension bridge the would be greatly superior to the structure which it is ros proposed to build. The suspension bridge espe-cially when built of these great proportions is a far-asic bridge to creet not being subjected to those beavy erection stresses which are the peril of large heave erection accesses which are the peril of large cantilever secretion. Moreaver the essential elements namely the authorages the towers and the main cables are at all times entirely free from suspicion, and may be erected with the absolute certainty that they are well within the limits of safe construction. With these main elements assured, it is possible for failures to occur in subordinate elements, such as the suspenders and stiffening trusses, without in the least

endangering the integrity of the bridge as a whold.

Not so, however, the cantilever bridge, the gree part of whose intricate framework is in compr Let but one among the multitudinous members of the main trusses fail, and the whole structure will be thrown into immediate and absolute ruin—as witness the mass of tangled steel now lying in the St Law

rence River For the credit of the profession of bridge engineer-ing in the New World, for the prestige of the great and growing people of Canada, and above all for the creater asfety of the public at large, we trust that, before the final plans of this great bridge are adopted the Canadian government will take stens to make it certain that the final bridge will, from every point view-ongineering, architectural, and artistic blest work of its kind yet erected in any country

#### CAUSES OF THE PARIS FLOOD

HERE appears to be a consensus of opinion among the French scientists that the causes of the recent phenomenal rise of the Seine when it reached the record height of 31 feet 2 inches, are to be found more in geological than in meteorological conditions. The basin of the Seine and the strams that are tributary to that river consists of a light absorbent soil, and, as the slopes are gentle any sudden precipitation is ordinarily absorbed by the ground. In winter when the soil is either frozen or enturated by the rains, there is a risk that the run-off of a heavy precipitation will be so large and sudder as to overtax the capacity of the river channels. These conditions obtained to a marked degree during the reeent continuous heavy rainfall and flood coologist is of the opinion that the heavy rains preceding the flood found the soil of the Seine water thoroughly impermeable because of saturation that the water ran off as swiftly as it would from the surfa of an asphalted or comented street Furthermore, seems to be generally agreed that the denudation of the ferests in the higher regions of the watershed has been a contributory cause to the flood. Not only do the trees assist evaporation but the forest undergrowth also nssist evaporation but the forest undergrowth also exorts a material influence in retarding the flow of

Referring again to the question of the prevention of future fluxes at Paris regarding which we made editorial comment last week, there is an siternative plan to that of dredging or widening the channel and the removal of river piers which, were it not for the enormous expense involved would afford an absolute safeguard against future disaster. We refer to the beroic measures employed by the Austrian engineers vent the floading of the city of Vienna by the Danube This consisted in cutting an artificial channel entirely around the city through which, after the river reaches a certain elevation all the surplus waters are diverted and discharged into the river below the city. It would be possible to create a sim that by pass around the city of Paris, but the cost due the great value of the land which would have to condemned would probably be found to be prohibitive

### WATER COMMERCATION IN NEW YORK STATE

FFER about three years of investigation of the subject of water resources, the State Water Supply Commission estimates that i 500,000 horse power of water energy is run-ning to waste every year in the State of New York and that if this were developed according to plans drawn up by its ougineers the State would realize a venrly rental of at least \$15,000,000

As a result of its investigation of the water the Hudson, Genesee, and Raquette rivers the Comthe Hulson, tenesse, and Haquetta Fivers Ind Com-mission has located and surveyed four reservoir pro-jects for the development of water power and the control of foods These are the Sacandaga and Schroon Lake reservoirs on the Hudson, the Portage reservoir on the Genesse, and the Tupper Lake reser-voir on the Raquette The Commission considers that the Hudson River, because of its size and the large the risuson filter, because of its size and the large population and important industries of the cities sit-uated along its banks, should receive the first consid-eration in any system of conservation that may be adopted, and it recommends the construction at a acquired, and it recommends the construction at a point on the Sacandaga River, 50 miles north of Albany of a dam and storage reservoir of 29 billion cubic feet capacity. Such a dam would convert 30 miles of the present river valley into an artificial lake of the size of Lake George

The principal object of this reservoir would be to The principal object of this reservoir would be to hold back and score the flood valuers, and afford re-lief during the low-water conditions of the summer to the various power plants along the Hudson. by releasing sufficient water to maintain the level of the river at the desired stage for operation of the Evidraulic plants. In addition to the great benefits attributed by section of the stage of the river

water, the power developed directly in connection with the bit dam would be transmitted electrically to such towns as Albany, Troy, Mechanicaville, Glens Falls, Utloc. Schementady, and other less important communities lying within the sone of conomical electrical transmission. It is estimated that the reservoir would transmission. It is estimated that the reservoir would cost 44,556,000, that the total yearly fined charges and maintenance would amount to \$237,700, and the annual gross carrings \$427,500, leaving an estimated annual not revenue to the State of \$195,000 The Commission estimates that on this basis the cost of the reservoir would be refunded to the State in fifty years it five end of which then it would be the sole years at the end of which then it would be the sole years at the end of which then it would be the sole that the work when the proposal income from the sale of the stored up read an experience from the sale of the stored up read that the work he meter.

The Commission advises that the work be under-taken by the State, because under State control the necessary funds can be provided more economically, and the interests of the public can be absolutely safeguarded it recommends the enactment of a law au-thorizing the development of the power of the Hud-son River, the construction of a storage dam on the Sacandaga at Conkilagrille, the amendment of the Constitution to permit the flooding of State lands constitution to permit the notating of state install in building storage reservoirs to be owned by the State, another amendment providing for a bond issue to meet the expanse of building reservoirs, and the building of other reservoirs to regulate the flow of rivers for power purposes and flood control

### STEEL BELTS.

N Germany steel belts are used in many large factories and electric power stations. The prin-cipal difficulty connected with their employment is that of joining the ends of the beit ends are now provided by the makers with strel plates which need simply to be screwed together. It is necessary to use steel of special quality and temper advantageous to cover the belt wheels with coar 188, to which thin slives of cork are attached in order to prevent slipping. The cork lasts practically forever and reduces the sliding to less than one tenth per cent and requires the site of the control of the travel. Prof. Kammerer has experimented with a steel strap, two-fifths inch wide and one-fittleth Inch hick, with two wheels, eight feet in diameter for the transmission of 16 horse-power with a tension of 40 pounds. Although the wheels were not covered, they worked very allentiv even at a speed of 200 feet per second. The maximum slipping was one per cent of the travel and the loss of energy due to this cause was inappreciable.

Steel belts possess the following advantages stees outs possess the toilowing advantages The energy is transmitted without slipping and almost without loss, the belts do not stretch their width may be reduced to between one-third and one tenth of that of leather belts transmitting the same power, onsequently the wheels may be marrower and lighter and the workshop less darkened by them. The steel belts do not deteriorate appreciably they may be used in damp places and do not appear to be attacked by amoke or acid. They allow the attainment of velocities of 100 feet per second and are consequently very suitable for use with turbines. The required tension natiable for use with turbless. The required tension ion-cental beat than that of eachier belts transmitting the same power, because of the difference in weight from whith results an additional economy, owing to the diminished friction on the bearings. Much room an be saved by using steel belts because their efficiency does not depend upon their length. They can be used horizontally in place of paring. The makers rt that they cost less than leather belts of g

**cuality** The oldest steel belts have been in service two y The oldest steel belts have been in service two years. In a Berlin factory a leather belt 24 inches wide was usplaced by a steel belt 4 inches wide which transmits about 250 horse-power. The belt, after two years use, shows no indication of wear. The only objection to steel belts is that they are not easily seen, and exquently may cause accidents if they are not care-

A remarkable phenomenon was observed during a thunder shower in Finland in the aummer of 1908 by V. J. Laine, who was making meteorological observa-tions for the Finnian scientific society. The shower approached from the east and the thunder, which had approached from the east and the tunner, which had been beard at intervals during a half hour, ceased be-fore any rain fell at the place of observation. Dur-ing approximately the same half hour the eastern hori-son was completely apanned by a double rainbow, which likewise vasilahed before the rain came. Immewhich likewise vapianed before the rain came. Imme-diately after shich peal of thunder the colors of both hows and especially those of the secondary bow, be-came confused and indistinct, and the whole double came conhabd and indistinct, and the whole doubles rainbow appeared to vibrate rapidity. Latine explains bits singular phenomenon, in accordance with the Airy Pernet whoncy of the richlows, by assuming that the confession of the air which produced the sound of thander, also increased the dismeter of the rain drops from less than j/260 inch, to between j/56 and j/25 inch. If this assumption is confirmed it will furnish a wightable contribution, the the theory of these-ders sorress, which is still functional feet.

## Scientific Američan

#### ENGINEERING

According to a recigi dispatch, a contract for the construction, at a cost of \$100,000, of a dam; which will form part of an irrigation scheme in the southern spection of the island of Porto Rico, has been awalful to native engineers, who secured the award in genuicition with four American firms. The total cost of the scheme in \$25,000,000.

The heaviest rainfall over recorded for a single day on the lithmus of Fanama occurred during the great Soud of last Docember, between the hours of 10 A. M Docember 58th and 10 A. M Docember 19th, when the ring gage at Porto Bello showed a fall of 10.86 inches. The total full for the month was 58 17 inches, which is equal to an average rate of nearly two inches a day

The stern frum, radder, and brackets for the new White Star liner Orignoje. Which were recently suppiled by the Darlington Forge Company, are the heavslet ever cent for a stounkibly. There total weight in 339 tons, made up as follows Stern frame, 70 tons, after boss arms, 76 tons, forward boss arms, 64 tons, and radder, 100 tons. The total weight of the same parts as cent for the "Startednia" was 250 tons.

The rapid elimination of the sailing ressel is shown by statistics recently given by a German paper. In the twenty years between 1888 and 1908 the percentage of sailing vessile has declined in the merchant marine of Great Britain from 411 to 124, of Germany, from 23.1 to 191, of the United States, from 307 to 309 I not merchant marine of France, however, but little change has occurred, the respective percentages being 479 and 472.

According to the French paper Matin, the Minister According to the French paper Matin, the Minister of Markins is asking of the construction of two dread-nongists of 33,000 tons such in a programme which has exactly the state of the state

The locomotive recently built for the electric operation of trains through the Cascade tunnel of the Great Northern Railway, where the electrical equipment extends for about its mine, weights about 139 tous and in farmished with four 3-phase 40-brose-power motors working on a 50-broit, Me-gree circuit. The pressure more time in 60-broit, Me-gree circuit. The pressure man and the contraction of the contraction of the circuit within a circuit by water power, has smill ent cause: try for the occusion of sixty miles of the lime.

The Public Service Commission has recently adopted an order requiring the New York Subway operating company to install on all subway cars destination signs, similar to those now used on some of the cars of such train. The company must also post in all six thous, near the ticket office, a map showing the locations, of its routes and the streets intersecting the subway likes; and all stations must be equipped with lite-difficulted signs, piaced on the subway wails, for the Perpose of warring passengers that they are approach-former of the company of the com

Il is olemed that the lighthouse establishment of the United States government is the most complete and efficient in the world On June 20th, 1999, the source included no less than 1,463 lighthouse keapers; and during the facel year of 1910, fit additional lights, requiring the services of 47 Exepars, will be established Legislation in being sought for the seriablishment of three additional lighthouse districts, covering Alaska, Porto Rive and the naral station at Guantamano, and the Hawalian Inlands. The cost of the establishment last year was \$3.574,000

In a recent communication to a New York paper, Mr. Hodoson Maxim shows the futility of attampting to work any serious destruction by the dropping of dynamics from a flying machine. He states that the destruction effected would be very much less than any-nee not acquainted with the action of high explosives would suppose; and that many tens of dynamics might be exploided in the middle of Makions Square without any more serious damage than the Alowing out of the windows of adalount buildings by the rush of air toward the explosion to fill the void formed by the unwhat of the basic gases and air.

upreash of the heated gazes and air.

A ward of varraing has recordly been given by J N
Buller, an Hagilais engineer, to those who are contempleting an investment of their power plant by utilize
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#### ELECTRICITY.

Zone than a year ago the New York Public Service Commission of the Second District issued an order limiting the number of passengers that could be carried on each car of the Pine Rillis line in Albany Ther? was so much public dissatisfaction with this restriction that the order has recently been withdrawn.

A report on the its and pole consumption in 1808 has recently been insend by the Consus Bureau. The total number of ties purchased by electric railways for the year vas (48,58,88,6 which, 45,81,156 were been and the rest sawed. A large majority of the ties were and, the number being 3,414,405, chastant comes second with 1,488,138, while Southern pine and codar follow with 144,400 and 830,687 respectively. The number of poles bought by electric railways and electric light and power companies was 83,149, which is considerably jointly of the poles were roder, viz., 286,689, chestant comes second with 186,050

In place of the ordinary windmill type of tower there was for not tower in now beginning to find favor. It consists of two columns apaced a short distance apart and con nected by horizontal members. The plane of the tower is transverse to the direction of the line, and at its upper on the transperse at cross arm on which the transition lines are supported the advantage of the construction over the rigid windmill type is the fact that its case of a break in the line each tower would give somewhat and distribute the strain, thus prevent fing the towers from being pulled over one after the

The Elliacis traction system covers a territory 10 miles wide and 255 miles long. Much new work is being done along the lines of this system which requires the general manager to make frequent trips and a steeper and offers care built. In which he can conduct business while ex resir and which will early min over night from one point to another The managers care is well equipped with all the conveniences that he might desire on his trip. It is provided in the forward part with an office room so arranged that it can be converted into a bedroom with four berths separately curtained off. In addition to this there is a dising room and kitchen. The overall length of the

In the recent report of the Royal Commission on Canals and Inland Navigation of the United Kinsdom, the Canals and Inland Navigation of the United Kinsdom, the Canals and Canal

One of the axibitie at the recent Chicago Electrical Blow, which attracted considerable attention, we the government aeroplane fitted with a wireless telegraph receiving and sending system. The chief difficulty in fitting up an aeroplane for wireless telegraphy lies in the fact that it is strung with wires used for bracing the parts and those interfere with the reception of the message on the short attenue available on such a machine. The difficulty was overcome by stringing three strands of No. 14 copper when available on such a strands of No. 14 copper when along the under strands of the upper plane and connecting these strands with a part of the strands with a strands with a strands with a strand of the strands of

A novel proposition was presented before the recent meeting of the American Institute of Bleetice Blagimeers by Prof. W S Franklin and Mr S. S. Seyfent. They propose to reduce the length of single-plean erries motors, so that motors of higher horse-power can be accommodated in the space between the drivers of a locemotive. The reduction of length is offered by using a stationary active arrangement of the statement of the st

#### SCIENCE.

Count Finnhest, the Director of the National Museum of Science and Art, Dublin (Ireland), has received notice of a bequest of £5,000 to that institution, left by Mr Patrick Murphy of Newry

A crew of eleven map makers of the Geological Sturvey, under the leadworkly of Chief Topographer C if Bliefers, are mapping the Hawalian Islands Their work will occupy all told about eighten months, by the end of which time it is rhought that they will have succeeded in making detailed maps of Kenul, Onlin, Belokals, Mauri, and Iriswall This work is prolimited by the control of the relamation service of Hawali and the control of the relamation service

Are the senses were vications? The question is disused in Nature by Prof. McKendrick and by several used in Nature by Prof. McKendrick and by such billed men. According to one correspondent the popular notion that when a person loses his night he is componented by the effect of shillty in one. If not all, the componented billed men of the points out that the imputation of striking ability does not enable a specialty intended billed men to earn his live limited by the exercise of that shilling. The billed are credited with powers for mustly, basels making and the like but when they sawert their right to live the ordinary lives of citizens they are not perfeitled to do no

With the ordinary moving piture machine photorspile 2 by 17 ocutimeters are taken at about the rate of 16 per second, which is much too slow for taking a piture of a builter or other projectitle in flight. Even if the rates were 60 per second no attlifactory results rould be obtained. In a revent number of the Zeitschrift Instruum tienk, C Cranz describes a builtie in the inner to the contract of the contract o

The last opposition of Mars, although eagerly well comed by observatories of the world has by no means settled the permital problem of Martian surface ankt, fugs Mr Lowell still insists that the sees the sanale Prof. Ritchey has not succeeded in photographing them, and Artoniald still doubte the visicence of the standard it would seem that the time has come for startonomers to roard some definite, agreement and as cordingly Mr R O Alka in a recent number of \$1. the tree situal into of planetary detail such as \$8. bits nard, W H Pitckering and \$5. M Autoniald to cume to Figarian to Join him in observing Wars at its next opposition and thus seth care and for all what is really seen at Planetar

Commander Feary has plated before the Board of Managers of the National Georgraphic Society as proposition in behalf of the Peary Arctic Club, to the effect that the Goographic Society along with the Peary Arct the Club in an Antarctic expedition the Arctic Club in an Antarctic expedition the Arctic Club in the Feary Arctic Club in an Antarctic expedition the Arctic Club in the Feary Arctic Club in an Antarctic expedition the International Peary and the International Peary on the Short Pelectrips and the Goographic Society of furnish funds for the other step uses to the amount of \$160000 in the Expenses above \$20000 to the International Peary Arctic Club Commander Peary delines to in add the expedition humanic managers and the Peary Arctic Club Commander Peary delines to in add the expedition humanic men. Bhould the plan be carried into execution it is not unlikely that almost all members of the security of the Conservation of the Peary North Pole expedition will proceed to the Antarctic to the Rossevati

Prof. Frank H. Moordon of the U. S. Geological Grevey, has just published in the Britthmonian Miscel laneaus Collections a short paper centited Descriptions of Foods Plants from the Messoois and Cessonia of North America." The paper in indeed development of North America. The paper in indeed development of two new foods clashed-sens, the first of which called Woodwords mazoni, was found in the Port Union formation near Rock Springs, Nyoming R to of special interest from the fact that it is very closely predict to the common chain from so widely distributed taries and Michigan, and south to Florida. Indeed, the common chain from the Plants foods and Arkansas. The other new spece as hich he names Woodwords of Collection in From the Plantscene and Arkansas. The other new spece as hich he names Woodwords for Collection in From the Plantscene and Arkansas. The other new spece as hich he names woodwords for Collection in the Collembia River in Oregon II, illewise, recembles closely a living species originally described from Marice, but also found in Guatemala Arksona, California, and Washington Toyle Konwitten also described as Pransatardica american, which is characteristic of the Fort Union format into a collection of the Collection of th

# A NOVEL AMERICAN MONOPLANE

The monoplane illustrated herewith is one of the most novel aero; lanes which has thus far been produced. It is the invention of Mr. A. L. Pfitner who for some time past has been as sociated with Mr. Glenn H. Curtias in the production of his aero planes.

This new monoplase while resembling the Curties big has in some fatures is a distinct departur from, the turns is a distinct departur from the unual typ, of single surfa on machine such as produced abroad by likelid and the Antoin to Company Lulike elegifs of the methics and carrying a six of wings near its front end in higher of this there is a single plane mounted upon four vertical wood rates at the cutter and having a fixed a six pie-surface horizontal rudder for the control of the cutter of the higher of the third winds and the third that is the cutter of the horizontal rudder for the for front The writch rudder is placed in front just above and at the right of the cutter of the horizontal rudder. But not refer the forth cutterface always within volve of the action. They are the cutterface always the cutterface are therefore always within the view of the action. They are the cutterface are therefore always the cutterface are the cutterface and the under side of the monoplane at each end for the purpose of the that all three controls are operation the under side of the monoplane at each end for the purpose of main taining the transverse stability. The fact that all three controls are operation that is the purpose of the control and the purpose of the third three controls are operation to the simplese to drive of any thus far produced.

The plane has a spread of 1f feet and a four-and it width of 5 if. The plane itself is but 31 fet 2 first. The plane itself is but 31 fet 2 first. equivalent to an area of 15t a square fit. The albling wing tips are cash 22k fixt by fet from front to rear. The hostionnial rudder is 6 x 1 feet long by 2 first high. The dimensional airc and the vertical rudder 7 five long by 2 first high. The dimensional of the tail surface are 6 x 2 feet and 1 to total x light of the machine the tanks being filled with 6 gallons of gasoline and I gallon of oil and the radiation with 1½ gallons of water is 400 with 1½ gallons of water is 400 miles.



Copyrigit 191 by H M B s or Rear view of monoplane, showing movel sliding wing tips

This is who we the fire I tail at it rear and the home a tail milder with vertical rad let shows it is from to fit a single place.



W: Pfitzner at the control wheel of his moneplane
this vi wsh wathest Licontr 1 wheel Us power plant and the ribs and trusting of the plane
THE FIRST AMERICAN MONOPLANE TO FLY

counds The weight carried per quare fost is therefore slightly more han 3 bounds

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The four vertical posis forming the chassis terminate in forthe of seamless terminate in forthe of seamless terminate in forthe of seamless than the seamless of the seamless o

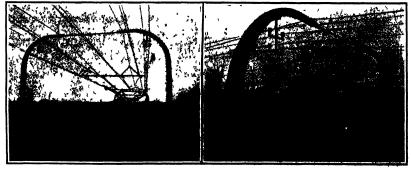
# NEW OVERHEAD ELECTRICAL CONSTRUCTION ON THE N. H R.R.

The New York
New Haven &
Hartford Rail
road (ompany is
no well satisfied
with the operation of its electrical rone from
Tamford to New



Diagram showing details of new overhead construction

York that it has decided to extend the electrification for another forty miles to New Haven The company is also (Continued on page 154)



General view at Glendale showing the light and pleasing appearance of the construction.

Near view of a pair of curved supporting columns, showing a trigoguisted pife hanger, suspended from the two 14-duck main carrying caldes

# SMOKELESS POWDER—METHOD OF MANUFACTURE. -- II.

BY ROBERT G SKERRETT

In the issue of the SCHWITTIC AMERICAN of February 5th it was shown how greatly the improvements in the power of naval guns are due to the introduction and development of smokeless powder The present article is devoted to the description of its manufacture The base of our smokeless powder is cellulose—that enderful and yet indescribable form of matter—Cot

wonderful and yet indescribable form of matter Cot ton is one type of pure cellulose in 1832 Braconnot discovered that starch dissolved in nitric acid and when cleaned in water became an intense explosive. A little later Pelouse obtained the same results by soaking cotton fabrics in that acid



The nitrating house is like a great, gloom laundry the cotton being discuted in or fugal wringers like those in which (lother are washed

and then washing them in water. This was the first step in the evolution of smokeless powder. Because of the great violence and erratic behavior of the explo-sive thus discovered it took years to develop it into a safe propellant More than half a century ago Aus tria and later Prussia used nitrocellulose in their ord nance but its impetuous action could not then be properly curbed and a series of accidents and unex pected explosions caused its abandonment. Years later when the speedy torpedo boat and the rapid fire gus arrived Fr nch chemists through stress of need found ways to check the explosive violence of gun

m and to fashion it into a safe and practical propeliant We followed France but our powder has been the immediate offspring of that produced by the mat Russian chamist Mendaleft

It seems paradoxical that we should seek for a safer It seems paradoxiest that we should seek for a nater and less videox propellant than common guapower by adopting for a base an explosive will known to be more vigorous and more usurily. The secret ideox word by the chemists proved nitrocellusion to be among the common state of the common state of the chemists and the common should be able to the induces of deterrent agents with a smell sole to the induces of deterrent agents with a similar significant in a remarkable way the rapidly with which the granules burn and greatras the property calling gazes. Bonche'ses powed or can now be made in grains of such size and such form that the conditions imposed by each celliber of gaze can be med at the musule welcotty of the shot revulated with auton the medium of the condition of the co ishing pre-kion. Thus the task of the ordnance engineer is now quite opposite to that of former days. To day the gun is designed to meet certain requirements while the propellant is afterward made to suit the gun

Now for the manner in which harmless cotton is Now for the manner in which harmiese cotton is transformed into a ballistic agent at the Navai Pow der Parctory Indian Head Md No offitial servets are betrayed because the value of the process lies in the nies proportioning of the various ingredients com bland with particular forms of grains. These niceties are the outcome of lessons learned after much experi menting in which the variation of a tiny frantion of

an inch may either make or mar the product Cotton when steeped in nitric acid becomes soluble Octon when steeped in nitric acid becomes soluble in a mixture of ether an discloud if the juvice and in the second of the first of the second der is a brother of collection so useful in medicine ar the art of photography while colluidd in its endisses; plications is a flist cousin and lies just beyond the

dividing line of those substances soluble in ether

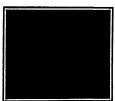
dividing the of those sussesses should be also believe the blooms straight from the fields or the white mill waste in either case the cotton is cleaned by an alkaline both and then well died in an atmosphere of .12 d g F The then well died in an atmosphere of 1/2 d g F The worken to li in this temperature but the p if ct dry ness of the air explains why they are not boiled alive The object of the drying is to make the cotton more, absorptive in the self thus insuring more nearly per-fect nitration. After the cotton has b n dried it is



packed in air tight conisters and sent to the nitrating house where it is soaked for half an bour in a strong mixture of sulphur and nitri a ids. The reaction mixture of suijouit and nitri a los. The reaction frees from the cotton a jer uniage of molature which if not withdrawn would dilut the nitri a id and affer t the character of the jordut Suiphuria acid has a strong affinity for water and it extra is the thus kaying the nitric acid unimpaired and apable of doing its full work upon the cotton

The nitrating house is not unlike a big steam laun

(Cninclingag 11)



ow shows the important precess of shing the cetters in the alkaline both for the purpose of re-moving all traces of ed.



The 'pyren is plied into open tubs, and tre to steaming tanks, where it is belied belied to extract the major part of the rilinging still.



Eunning the fluin pulp through the " whence it comes from the reliers





inhydrating house, where all but a very small percentage of the liture is extructed by presents and family by the use of alco-hal to drive the dampuses before it and heaves manufa of the spirite behind to form the modful mission.



NOT RECEIVED FOUNDS IN MARTINGTONS

# A WAY OUT OF THE MARINE TURBING

Provided that it can be run at the high speed at shield its fall efficiency can be assured, the steam turbles is the most economical of all steam engines On land, as a drive, say for electric generators this high speed of rotation can be employed, since a type of generator may be coupled up that is suitable to that speed. When the steam turbline is employed to drive the propellers of a steamship, it is no longer possible to run it at the best speed for economy, and this for the reason that the propellers of a steamship, it is no longer possible to run it at the best speed for economy, and this for reason that the propeller at the outward end of the turbles shaft shows its own best efficiency at speeds of rotation far lower than those demanded by the turbles, there will be a big ions of efficiency at the propeller if we run the shaft all the maximum-efficiency as they only the turble to see this reproduct if the propeller if we run the shaft all the maximum-efficiency speed of the propeller, there will be no will run in the turble to see this run in the surface.

Here we have a dilemma which the marine engineer has hitherts found it impossible to avoid it. Has has altempted to cut the Gordian knot by a compromise, and has tried to find a mean speed of rotation (too slow for the turbine, too fast for the propellor) which would give the best or rather the hast bad results on the 'road per homespower per hour' basis If requires no very keen discernment to perceive that the solution of the problem lies in the selection

It requires no very keen discernment to perceive that the solution of the problem lies in the selection of some suitable appropriate, and as far back as 1904, in a report to George Westinghouse, George W Meltilla, for former Engliseer in Chief of the Navy, and Mr John II Markhjube, made the following astasment; the former Engliseer in Chief of the Navy, and Mr John II Markhjube, made the following astasment; that the selection of the turbine with the comparatively low rate of revolution required by an off-ineal propeller, the problem would be solved, and the turbine would be a stroke of grant facelies.

intervening years three entirely different methods have been devised for meeting the difficulty One is to install high-speed turbo-generators, and utected to the propeller shaft and experimental work in this direction has given such good results that the o River Shipbuilding Company recently put in a for the equipment of our 26 000-ton battleships with an installation of this character. In another ave known as the hydraulic reduction drive, two hydrault turbines are interposed between the steam tur-bine and the propeller the one connected to the tur-bine the other direct-connected to the propeller, with controlling valves between the two which enable the speed to be reduced to any desired extent. For both of these systems it is claimed that high efficiency has been secured. The third method (the one shown in the accompanying illustration) consists in the use of a mechanical reducing gear During a series of exhaust-ive tests recently made at the Westinghouse shops, this experimental gear showed the astonishingly small friction loss of one and one half per cent. These results are far superior to those obtained with the other two methods, and unless some unforceen disadvantages should develop when the full-size gear comes to be installed on a warship or merchant steamer it may safe ly be said that in this reduction gear has been found the final solution of the marine steam turbine prob

Il was no easy tank to devise a gearing which would in a monthly and without excessive wear at the was mostly as process required for steam turbines, and at the same time transmit the thousand to home-power post interest to home the way to the properties shafts, which amounts in the case of the Waserschaft a hount 18,000 home-power post of the Waserschaft a hount 18,000 home-power post in the first page of this issue was constructed at the wind in the high the shaft was the shaft of the waser than the waser than a large of the waser than the waser thas the waser than the waser than the waser than the waser than th

As will be seen from the illustrations, the pears are helical that is to say, they do not run straight across the face of the wheel parallel to the axis, as in the case of ordinary sour gears, but they are cut in the form of a steep spiral. This construction allows the wheels to roll into contact without shock or jar. Of currse, this helical form of tooth causes a strong end thrust in the direction of the axis of the shaft, and in order to prevent this, sue-half of the gear was cut with the spiral running in one direction and the other with the spiral running in one direction and the other way the end thrust, due to the obliquity of the testb, is completely belanced.

In spite of the marvelous accuracy with which the teeth of gears can be cut by modern machinery, it is impossible to form them so truly and align the shafts so perfectly as to get an absolutely uniform contact throughout the entire length of the gear This is an

important consideration in all gears, but becomes doubly so when, as in this case, they may have to transmit from ten to twenty thousand horse-power. The inventors have mot the difficulty by a very in-

The inventors have met the difficulty by a very ingenious construction designated as a feating frame,
which they describe as follows: "The remove which
carries the hearings for the pintion is a heavy steel
castless empoyered only at a single point of the castless of the pintion, but is held securely
against mettion in any other direction. Furthermore,
the pinton is free to move endwise in its bearings
any instance, of the teeth to bear harder at one end
of the gear tians the other would tend to unbialence
the respective end thrusts due to the right and lefthand spirals of the teeth, but as the pintion cannot present any resistance to unbialenced end thrust, it constantly adjusts itself in the direction of its axis to
the position corresponding to equilibrium between the
opposing forces. This means that the tooth contact
pressures are always automatically equalized.

ressures are always automatically equations. "If there are any insular foregularities in the spacing of the teeth, which would tend to make the contact harder at one point than another in any part of the revolution this tendency is defeated by the floating frame, the position of which about its central support or faircrum is controlled solely by the pressures of the testh of the plares are Naturally, the floating frame always yields under the eath of the testh of the plares with the support of the position of the positio

The grat was tested by means of a special hydraulic brake, the reduction gare being interposed between the turbine and the brake, and in six test the brake horse-power delivered by the gare at different speeds varied from 3,712 to 5,327. Since there is no way in which to measure the indicated horse-power of a steam turbine, it was necessary to establish the exact brake horse-power in some other way. Fortunately, it is a characteristic of the steam turbine that, as long as the speed and exhaust pressure are maintained contant, the absolute index pressures or commercially dry steam is a very accurate measure of the brake horse-power the turbine is developing, decoratingly, as dynamical extensive the steam of the

|                  | B. H P of turbine as |        |
|------------------|----------------------|--------|
| I II P delivered | determined from in-  |        |
| ph Ber           | let press, etc.      | Resear |
| 3,712            | 3,771                | 98.7   |
| 4,156            | 4,197                | 99 0   |
| 4,576            | 4,628                | 98.9   |
| 6,036            | 5,108                | 98.7   |
| 5,486            | 5,567                | 98.5   |
| 5,927            | 6,057                | 98 7   |

A reliable check noon these results is afforded by the rise in temperature of the oil with which the gear is lubricated since the transmission loss in the gear appears as heat in the oil By measuring the quantity of oil circulated and noting its rise in temperature, access approximation to the number of British thermal units lost per hour is obtainable when he gear was delivering £0.88 horse-power, £61 pounds of oil were circulated, with an average rise in temperature of \$2.86 deg. F. from which it follows that the total heat absorbed per hour was \$14.205 British thermal units each sold per hour is the sequence of the personal person of the sequence of the person of

reason With these results before him, Mr Westinghouse has made an investigation of the scopessies which could be sourced by applying the gast to the Consender "Meatricials" and "Lusitania," which are such explained to the Onzarders "Meatricials" and "Lusitania," which are such explained to the Consenders of the Conse

probably dose, set exceed, it per out. If we, the actual effective propelling power is only about \$18,850 horse hower. At the favier eject of revolution resulting from the one of the recipitor great, propellers could be installed that would have an efficiency of not less than 85 per onni; which means that the shad horse-power required for the same affective propelling power would be actually to the same affective propelling power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the same affective possible power would be actually to the power and the same affective possible power would be actually to the power and the same affective power and the same affective power would be actually to the power affective property and the power power and the power power power and the power power power and the power pow

equipment and the coal consumption on such voyage abent consumption. On the control of the concentra at the propoller than the control of the

Now, the steam consumption of the turchines of the "Marstanian" is believed to be should 1.6. pounds per shart horse-power per hour; but it has been proved that it turbines of similar capacity, operating at speeds which the reduction gear makes possible for marine service, the steam consumption does not exceed 11 pounds per shart horse-power per hour. This means service, the steam consumption does not exceed 11 pounds per shart horse-power per hour. This means service, the steam consumption does not exceed 12 pounds per shart horse-power and the total efficiency of the whole propaller, could be further reduced to about 45,000 porse-power, and the total efficiency of the whole intillation would result in a reduction of over 35 per cent in the coal consumption. These vessels burn about 4,700 tons per vorage, and since the coal coats about 4,700 tons per vorage, and since the coal coats of the coal coats that the coal coats that

to the eargo capacity
But there are further economies, as will be seen by
reference to the illustrations on our front page, which
show the space occupied by the present turbine equipment of the "Mauretania" and that necessary if small
ship-hoped turbines combined with reduction generawers employed on three propeller shafts. These recomment is unnecessary and further
comments as monocessary.

All the advantages that would result from the supplyment of this device on merchant steamers would be realized also on naval vessels, together with other collateral advantages due to the fact that the high-speed turbins would not suffer the large drop in econ only which results, in the case of the present turbins, when they are operating at cruising speeds. With the superior steam economy of the high-speed turbine the bolier capacity would be reduced fully mathird, and with the same bunker capacity the radius of action with the same bunker capacity the radius of action to the composity increased—a consideration of insalents he may be considered operations of insalents and the strength of the s

## The Current Supplement,

Among the big things which the big situe of Call formis produces are catriches. These brits are call icreased by C.F. Holder Mendel's laws and the origin of species are so popularly discussed by Prof Club. Witt. Herbert A. Humphrey writes on an internal combustion purpose and other applications of a new principle. His aim has been to produce a pump of more simplicity and strength of construction, in which the expensive forces is exerted directly upon the vatice, and in which no retains sirved products, solid piston, considering the which are retains solid piston, considering the which are retains solid piston, considering the which are retained forced by the considering the which are retained for the considering the which are retained for the considering the retains a consideration of the control of the c

#### Scientific American

## Correspondence.

#### THE PIECE "ALL-BIG-GUE" SHIP.

The states "Allocate over 1 mars,"
To the Editor of the Scientific Assurement States on In glancing over your issue of Novamber 20th, I was struck by your correspondent's interesting article, "A Dreadnought of 1863" However, does it not seem Dreadnought of 1863." However, does it not seem more logical to go back a year earlier to Ericsson's "Monitor," which was without doubt the first "all biggun" ship built. The "Roanoke" was really a combiation of the "Merrimac" and the "Monitor" like her antagonist, a rased frigate, and resembling the "Monitor" in the matter of her turrets, therefore, it appears that the "Monitor" was the original dreadnought, and the present mighty vessels of that class are but the design of the great Swedish American engineer applied to occan-going vessels. For be it known that Ericsson never intended to employ the "Monitor"

Brooklyn, N Y GERALD ELLIS GERALD BLLIN CRONIN

#### MONTING A RIPLE.

## To the Editor of the Scientistic Am

I was interested in Mr Woodland's article. "Sighting a Rifle," in your January 22nd issue, and I would like to mention a point which I think he has over looked, vis., the jump of the rifle looked, viz. the jump of the rifle. This term refers to the angle through which the barrel recoils while the projectile is traversing the barrel. In off hand shooting, the rifle recoils upward, and sometimes slightly sideways about a center which is probably a little forward of the butt plate. The correction for this should be applied to both sightle, and directly proportional to there! distance from the center of proportional to the rear sight is very near this center, and has but as the rear sight is very near this center, and has little vertical movement due to the jump, it is suffi-ciant to slovate the front sight through this angle (This is done by the manufacturer, notice the high front sight of a six shooter which always has a con-siderable jump) Mr Woodland's plan was evidently to make the correction on the rear sight only, and while this would been the forest sight leaves and while this would keep the front sight lower, and would correct the angle of jump, it still introduces a constant vertical error at all ranges—an error equal to the vertical movement of the front sight While this is small, and perhaps negligible for the 0 22 call bers, it would still affect his calculations slightly The bullet would strike a little high, tending to intersect the line of sight nearer in the ascending branch farther in the descending branch of the trajectory Chappaqua N Y

## CURIOUS PACTS ABOUT SQUARES AND CURES

I have discovered the following curious facts about squares and cubes. These facts, in my opinion, are interesting from a scientific point of view besides be-ing of some practical use I shall be very glad to have you publish them if you doem them of sut worth

1 To be a square a number must have for its unit's digit one of the digits 0, 1, 4, 5, 6 or 9 This, of course, is well known but I put it down as an aid in understanding the other facts.

2 To be a square a number, if its unit's digit be 0, 1, 4, 5, or 9, must have for its ten's digit 0, 2, 4, 6, or 8, 1 e, the ten's digit must be zero or an even or 8, 1 a, the ten's digit must be zero or an even number If the unit's digit be 6 the ten's digit must be 1, 3, 5, 7, or 9 i a, an odd number if the unit's digit be 5 the final digits of the number must be 025, 225, 0625, or 5625 If the units digit be 0, there must be an even number of zeros at the end of the numb

3 A number, to be a square, must have as remainder when "nines are cast out" of it either 0, 1, 4, or Since the sum of the digits of a number gives the number remainder when divided by 9, as when the number is divided by 9, this test is easily applied by dividing the sum of the digits of the number to be tested by 9. To this test I can give an algebraic proof

4 A number, to be a cube, must have as remain-der when "nines are cast out" either 0, 1, or 8 This fact also I can prove by means of algebra
I can furnish you with a device, if you desire it, by

means of which, the squares of the numbers 1 to 25 being given, the squares can be written off in order od libitum without any multiplications Normal School, Peterboro

G H Kranz

## MIM PROE AND MRS. WORKHAM.

To the Editor of the Scientific American
After her ascent of the lower north peak of Mount
Husscaran in Peru in 1908, Miss A Peck wrote in
Husper's Magazine and in other periodicals and papers the following

regarded as certain that Huascaran is above 23,000 feet, hence higher than Aconcagua, 22 800 feet, and the loftiest mountain known on this hemis phere If, as seems probable, the height is 24 000 feet, I have the honor of breaking the world's record for Knowing from her own statement that Miss Peck made no instrumental observations above 19,600 feet on Husscaran, and believing, furthermore, Aconcagua to be the highest mountain of the Andes, I decided to test the truth of these assertions by sending expert san engineers to make a dotatled, up-to-

European engineers to make a dotailed, up-to-date tri-angulation of the two summits of Mount Hussearan. The only provious known measurement of this mountain was made many years ago, which is said to have given a height of 22 180 feet for the south or

Prof Schrader, who a few years ago made the most suthentic measurement yet made of Aconcagua and M Henri Vallot, both well known French scientists and heads of the Société Genérale d Etudes el de Tra vaux Topographiques of Paris undertook to assist in getting up the expedition, and gave the matter their

close personal attention

M de Larminat, expert engineer who has carried
out important survey work for the above society was selected as chief of the mission in July 1909 ac companied by two other competent topographers, he started for Peru

Favored by good weather conditions and assisted a to transport by the Peruvian government they ex-cuted a careful and detailed survey from the sea to Yungay and by actual measurement established the heights of four stations in the Black Cordillers, from each of which they triangulated the two peaks of Huascaran, so that Huascaran now stands as one of the most accurately measured high Andean moun-

The results are Height of north peak climbed by liss Peck, 21,812 feet, of south peak still unclimbed, 22 187 feet These figures may vary by a few feet but not many when the calculations are finally gone over by M Vallot for verification

over by M Vallot for verification. Mount Aconcagua nearly 22,900 feet, still remains, as I predicted and as Sir Martin Couway and other Andean explorers have always maintained, the highest peak of South America

Miss Peck's highest ascent to data therefore stands north peak Huascaran 21812 feet instead of 24 000 feet, as she estimated it, and she has not the "honor of breaking the world's record," either for men or women, for my two highest ascents of respectively 22 568 and 23,300 feet debar her from that honor in the case of women while a number of men have made accenis exceeding her highest

FANNY BULLAR WORKMAN

Official Meteorological Summary, New York, N. Y., January, 1910.

herk pressure Highest, 30 79, lowest 29 20, mean, 30 10 Temperature Highest 51, date 21st, lowest, 5, date, 5th, mean of warmest day 46, date, 21st, coolest day, 18, date 4th, mean of maximum 2187, Coolect cap, 18, care 4th, mean of maximum for the month, 38,8 mean of uninumum 260 absolute means 324, normal, 306, daily excess compared with the mean of 40 years, 18 Warmest motomperature of January, 40, in 1880-1890, coldest mean, 23, in 1893 Absolute maximum and minimum of January for 40 years, 67 and 6 Average daily excess since January 1st 18 Precipitation 561 excess since January 1st 18 exrems nauve January 1st 1 N Prespiration 5:11
greatest in 24 hours, 158, date, 13th 14th, avrage for January for 40 years, 380 Arcumulated excess attaco Zanuary 1st, 181 Greatest problishation 6:15, in 1882, least, 115, in 1871 Wind Prevailing direction, northwest, total movement 9:183 miles are rate hourly velocity, 122, maximum velocity 56 miles per the problems of the problem hour Weather Clear days, 7, partly cloudy 10 cloudy, 14, on which 0.01 or more of precipitation of curred, 14 Snowfall 188 Mean relative humidity 77.1 Sleet, 5th, 29th Dense for 6th, 21st, 29th

#### The Argentine Exposition.

The centenary of the Argentine Republic is to be ed by an international agricultural exposition s to take place this year. The exposition is to which is to take place this year. The exposition is to be oponed at Palermo (Bucnos Ayres) on Friday June 3rd, 1910 and will close on Sunday July 31st 1910 exposition will be divided into eight sections

Goology, Hydrology, Climatology and Geography in relation to Agriculture 2 Machinery and Imple 3 Rural Engineering 4 Vegetable products imal products 7 Means of promoting agricul-

ments 3 Rurai room.

5 Animal products 7 Means of promon...

ture 8 Special section for seeds

Entries and application for space may be written

French Puglish, German or Italiau, and Entries and application for space may be in Spanish Prench Paglish, German or Italian, and should be addressed to the Secretario de la Exposición International de Agriculture de 1910 Fordéa 316 Buenos Aires República Argentina These entries or applications for space must be made on the printed forms which the Secretariat of the Exhibition will be applications for the property of terms which the secretariate of the Parinton will furnish to all persons who may apply for them at the offices of the Rural Society at the address mentioned, or to the Argentine legations and consulates abroad Entries and applications abroad on he presented at the Argentine legations and consulates general on the dates and under the same conditions as any

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| 28        | 0 16 19 0              | 8 04 1R            | 0 0164    | 0 2563 | 55  |
| 24        | 0 15 28.5              | 8 04 28            |           |        |     |
| 25        | 0 14 88.4              | 8 04 38            |           |        |     |
| 20        | 0 13 48 6              | 8 94 35            |           |        |     |
| 27        | 0 12 50.1              | 6 04 33            | 9 8805    | 0.2443 | 66  |
| 28        | 0 11 55.8              | 8 04 26            |           |        |     |
| 29        | 0 11 00 0              | 8 04 14            |           |        |     |
| 70        | 0 10 05 1              | G 03 58            |           |        |     |

29 0 11 00 0 8 04 14 20 0 10 05 4 8 03 58 31 0 9 09 2 +8 03 57 0 8760 0 2250 52 During December Halley's comet became bright enough to be seen with telescopes ported views of it with four and three-inch teles Prof Philip Fox, director of Dearborn Observatory, saw it during the total eclipse of the moon on the morn-ing of November 27th with the 3% inch finder of the

According to the Harvard Astronomical Bulletin No 379, Prof. E. E. Baruard photographed the comet with the Bruce telescope on December 29th, and finds upon the photograph a very faint tall in position angle 69 deg with a length of 10 min. The tail was very slen

According to Prof E B Frost, director of Yerkes Observatory, Halley a comet will be visible to the naked eye about April ist. It will cross the face of the sun on May 18th at which time the earth will be plunged the comet's tail for a period of several hours. The ne of the comet's transit will be rather unfavorable for eastern observations, but undoubtedly it will be observed from the Lick Observatory in California and through other western telescopes. The comet will be visible to the naked eye about April 1st in the morning sky just before suurise. After it crosses the su will appear in the evening sky just after sunset

Atmospheric Electricity as a Source of Power.
The futility of the schames often prounigated for utilizing the electricity of the atmosphere, with its tension of many thousand volts, is made plain by the tension of many increasing voits, is made to reliable measurements that have been made, the strength of the current fewing from the air to the earth is about 10% ampere per square centimeter The maximum tension may be estimated at 100,000 voits mum tession may be estimated at 100,000 volts. Hence the influx of energy per square kilometer cannot permanently exceed 10.7×10°×10° watt, which is equal to 1/10° watt. This is equivalent to 1 kilowett for each 10,000 square kilometers (3,861 square kilometers (3,861 square kilometers). watt for each 10,000 aquare kilometers (2,001 square kilometers (2,880 square kilometers (2,880 square miles) of the earth's surface, and amounts to about 50 horse-power for the whole of the German empire, and 58,000 horse-power for the entire

What is declared to be the largest and most ex-positive bighter belt eyes made for driving purposes has been recently although from New York. The belt is \$46 feet long, 5 feet wide, three ply thick, and was ophaticable at a days of \$7,000. To make the belt the fallow it \$69 is a days of \$7,000. To make the belt the



# THE LOWE OBSERVATORY ON ECHO MOUNTAIN, CALI-FORNIA, U. S. A.

BY EDGAR LUCIEN LARKIN, DIRECTOR



Do you want to imagine that you can almost near the earth in its turning? No word printed on paper can control to the mind of a reader this impressive alloner shows the clouds When Scho Mountain is allence shove the clouds When Scho Mountale is within a heavy cloud the darkness is that of night From sunset until dawn whon clouds are excessively dense the jet black solitude is indeed welfed. The mind is always profoundly impressed and imagina tion is vivid and siert. In the midst of this quietude. and darkness lights are suddenly turned on by a dis-tant fland. Night turns to day. Ifuge masses of met-uls and wires in a dynamo in Los Angeles, in rapid revolution, cause the light to flash out on the moun revolution, cause the light to fiash out on the mountain toy. The observatory is on a sharp peak between two immense canyons, deep and wide. The mouths of these chasmes out in herstuina rocks are blacker at midnight than the imagination can conceive. Who knows the meaning of the word clear? None as able to understand what there means if it lings in a valley three and Ech Montainath the unresulprise is seen and the conceives the content of the content o

clear that the stars seem near enough to fouch, and the mountain air wonderfully pure. The stellar hosts glow with a brilliancy all unknown to those living any where near we level. At all times, save immediately after copious rains, the dust envelope surrounding the earth is visible beneath

It covers the an-To us on the moun tain top it seems at times as if every human would choke in this layer of dust Above us at night, shine Strius and Vega like huge diamonds, Arcturus and Spica likewise, and above all the giant star Canonus glittering with amazing brilliancy in distant south and fashing its rays over myr lads of wave crests tossins in the Pacific Ocean the brightest star in the relestial vault, cannot be New York The magnifi Orion, Hercules and the Polar Bear are so beautiful that words are powerless to describe th is astonishing to behold the apparent nearness of the galaxy Mountain perspective the purity of the air and freedom from vapor during twothirds of the year ds of the year com-to form an optical illusion

the summit of the moun

At times this deceninfluence approaches a night mirage, and one s to be walking among the very stars. Here the witching hour is at sunset a sunset of orange and flower laden plains and watery wastes beyond Round and about the winter solution the solar disk may be seen standing on the sea. Soon half of the mighty sphere only is visible. The last view is comparable to an are light. Then one by one the first magnitus stars are seen flashing between distant peaks.

stars are seen flashing between distant peaks. Be-fore the last gleam of the sun has vanished, Ale-barna, Altair, Rigel and Procyon Illianise the sky Many gigantie sentine-by peaks, and summist lift their hades within a radius of a hundred miles of the peak These life to the east to the north, and touch the sea in the west. The effect is that of an amphithe-ater. The result is open even down to the beat At-At sunset large stemmers look small indeed when compared to the face of the adjected num Artistantial have journeyed to Erich Mountain to paint its sunset. plendors to imitate nature on canvas. But brush and poncil are as impotent as words. The view of clouds presented herewith is one of hundreds of thousands. When the first rays of the rising sun strik such cloud banks as these, prismatic colors are see

that defy description—gorgeous oranges, carnations, and heliotropes beneath The effect is heightened by the singing of birds over the canyons. As the sun rises above the horizon the blossoming plains below, the domes and spires of Los Angeles and Pasadena, toe domes and spires or loss, with bods of delicate wistarias, and rows of faming red poinsetties, become visible. As the clouds are dispelled, miles after miles of trained cypress, pepper, orange, lemon, aprirot, almond, wainut, prune, peach, pear, and necta-rine trees, together with hundreds of long lanes, drives and roads adorned on both sides with tall, raceful eucalyptus trees, are seen Carpel a floor with jet black velvet, and throw down

upon it a myriad of diamonds in wild confusion, and perhaps you may conceive how the densely packed Milky Way appears from the observatory Millio is a word becoming astronomically obsolete; billio of stars is an expression much more nearly true of the Milky Way Billions of suns appear in the in finite deeps of the Galaxy These constitute the apfinite deeps of the Galaxy Those constitute the ap-jarent comic floor, the base of Nature, and of the stellar structure. In hundreds of areas, there does not seem to be place for more stars. Millions are finer than the points of fine needles, and these make or better, over the rim of the eastern canyon. Then millions of stars seem to be pouring into the depths of the rock-hown abyze descending low beneath the

of the rock-hern abyza descending low beneath the chearwatery. Phonds of stellar points flow downward, as seen in the reversing eyepiece.

The observatory on Mount Lowe is 70 feet in length The peak had to be cut down to admit the foundations. The selfempe is a fine Alvan Clark quanterial, with 16-the objectives. A fine Breakest telespectrospace here, and many other instruments. We have the care from the deeps of Ruble Charpon to the summit of Endo Mountain The length of this railway is 5,000 feet, vertical ascent 1,325 feet, and time of ascent and descent 8 initiates The sitting of the order of the owner. s,000 rect, vertical ascent 1,325 feet, and time of ascent and descent 8 minutes The sittude of the observatory is 3,490 feet, and is 4 miles from Pasadena, 13 from Los Angeles, and 18 from the nearest shore line of the Pacific.

inte or the Facilio.

The rallway from Los Angeles through Passadena
and Altadena lies in between or hards of orange trees.

Colden fruit may be seen during five months of each
year Almond trees in bloom and orange flowers and ripened fruit are objects eliciting the adm

This observatory was founded by the dean of living aviators, Prof

8 C Lowe, in 1894 Dr Lewis Swift was astronomer in charge until August 11th, 1900

# t Kinematograph **Biffe** Target,

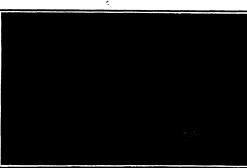
Among the novel uses for which animated photographs have been utilised one of the most inge is that recently perfected Messrs. J Paterson and J T Musgrave This is its application to rife-fire actice, the idea being to render the eye of the marksman keener, and to enable him to be more pert in the quick handling

The "bioscope target," as The "bloscope target," as it is called, is of very sim ple construction and opera-tion. There are two roll-ers, upon which is wound a sheet of paper of any de-sired size, like the films of a camera, the clear space between the two rollers comprising the screen upon which t

tures are thrown The lantern is placed behind the markmann in such a way that their novements do not interrupt or interver this the protection. Inmediately behind this provement of the protection of the protection of the intervent of the interv ablement, and so on. The indicator not only municates the individual hit, but at the complet the round, or practice, registers and gives value of hits made.

value of fits mass.

The range can be varied from 15 to 25 yards as desired. The paper across as it is destroyed by the bullet perforations is wound up on the second roller. The self recording uncohanten behind the screen is so prranged that it absolutely synchronizes with the movepranage that it accordingly procurement with the sevents of the object in the picture, at which aim is taken, so that there is no possible chance of a wreng value being given for an individual shot. The indi-cators are placed immediately, show the unrimment bead at the firing position, and a factal the can be signified by the ringing of a bell. as with the ordinary



Grand panerams from Robe Mountain. Looking due south from the Lowe Observatory Land area is 200 square ratios. The cloud as exactly over Passdera. The observatory as shown in the foreground. Less Angeles is to the right of this view

THE LOWIS COMPRISATORY OF MOUND MODIFFATH, GALLFORNIA, U.S. A.

a nevernest of starry sand. I never really saw this real base until with the telescope up here. After several days of rain, the atmosphere is swept clear of severs; carys or rain, the atmosphere is swopt clear or dust Then one is really within cosmic deeps when the tolescope suddenly sweeps over fathornless inter-stellar chasms, doors or windows through which one apparently looks into the very bottom of space. These areas are absolutely black. No sensation within the entire range of stellar research, at the hour of a mountain midnight, is so completely overpowering as mountain minningst, is so complessly overpowering as the vision of an abyse in the stallar foor Rousd and about these blackened wastes, there are cases where the stars are pilled in heaps, raked into wind-rows, or strew out this wings, streamers, diaments, and spray Yet of all these stellar houts the timiest oint may be a white hot sun, and larger than our

little star—the sun The giant nebula of Orion is a mass of starry is a fabric loaded with glittering points.

a more connect with gittlering points.

An astronomical telescope reverses all objects heaver
it. The rotation of the earth is very suparent on Bobb
Monntain. With high powers, the stars go racing
across the field of view. An increditly starting effect
is obtained when the telescope in set upon the Gislaxy
or Picindes just as they rise out of some distant pask,

buil's any target. The pictures, which have been specially prepared for use with this apparatus, are of such a character as to develop the calerity and certainty of the markaman's aim to the suprame degree. on the enemy appearing on the picture first at a relative 100 yards range. He drops

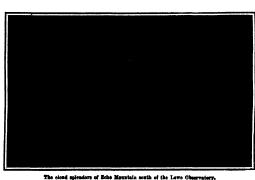
on his kuse and fires point blank at the marksman a certain number of rounds, corresponding possibly to a complete charge of his rife magazine. The marksman using the target raises his rife immediately the kinematographic cout is seen, but do scout is seen, but does not commence firing until the scout opens fire, the ap-pearance of a puff of smoke in the picture indicating the commencement of firing

The scout then retreats at the double to a distance corresponding to 200 yards range, when the same cycle of operations is repeated The scout then retires once more until he reaches a point correspond ing to 500 yards range, and the same tactics are once more carried through It will be seen that in each phase the target becomes decreased in size, according to the range, and at the maximum range offers a very small object to the marksman Moreover, the fact that the latter has to discharge the whole of his rounds in the short period tween the picture scout mmencing and finishing firing at each distance, in order to score, indicates that aiming and firing must be accomplished very quickly found t Yet it has been that in the course of but little practice, the marksman can pick up the range and conform with the firing conditions so ex-pertly that about ninety per cent of fainl shots can got in with each round at the respective ranges The invention is also ap-plicable to training in re-

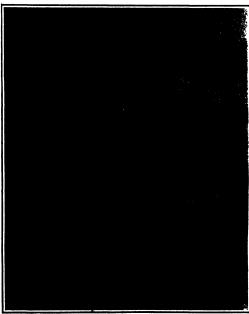
volver shooting, and for this work an ingeniously suitable film has been pre-pared. It portrays a con-flict with an armed housebreaker The burglar effects his entrance through the window, under which in the room, a roll top deek is drawn at an angle In the course of his work the burgiar is disturbed, presumably by someone entering the apartment. He instantly shields himself behind the desk, exposing but his head and shoulders, and cocks his revolver The burglar's disturber is represented by the marksman at the fir-ing point, who at the psychological moment the burglar is about to fire, empties his revolver In pties his revolver empties his revolver In this act the burgiar pre-sents a fair-sized target, with his protruding head and aboulders at a few pards range. The burgiar having emptied his arm turns to escape through the window, but in the act

the window, but in the act of dropping from the sill, to which he clings by one had been been as the best, and drawing his revolver case more, free. The markening waits until he one the burghar's head right spaces and past about the price and then shoots. In this case, within the protect was and the small sees offseed by the man's head and includered in possible, the sees softened to the marks and and includered in possible, the sees softened to the marks.

man's aim is somewhat small. The burglar indicator represents in silhouette the head and shoulders of the burglar in the two firing positions, and the vulnerable points of this part of the anatomy are shown on the indicator, so that the firer can instantly determine ther he has struck the target in a fatal spot, has



ade in this picture are about 1,000 feet below the building. Orenze tree orchards are dimir seer in the



This is not a volume in emption but a forest fire 6 miles west of the Lowe observatory, which fire started in La Canada Valley and traveloid its way to the summit, burning for several days. Coloneal fismes and empire house looked like a volume in action,

THE LOWE CHERVATORY ON ROHO MOUNTAIN, CALIFORNIA, U. S. A. inflicted a mortal wound, or has either missed entirely

or only inflicted a firsh wound

or only inflicted a feel wound
The projection is automatically controlled
The instern is electrically driven by means of a small motor, and this is operated from the fring position by
means of a small switch. The same picture can be

projected time after time, there being automatic de-vices for winding and rewinding the spool preparatory to projection Being electrically driven, a uniform to projection Being electrically driven, a uniform projecting speed is secured, and as it is directly under the control of the marketone is rol of the marksman the apparatus is only set in action when required

The idea can be de ed to an indefinite extent, ed to an indefinite extent, and the variety of pictures that can be used for im-proving the fire of the markeman is endless. It can be adapted for individual or company firing, and very realistic scenes can be pittorially produced. The application of the bioscope to this phase of military training often been advocated and attempted. indeed hut hitherto it has been found difficult to evolve a practi cal simple apparatus. The British War Office has inrestigated and subject the invention to searthing tests, and has ascertained that marksmanship can be o rapidly improved by this means that its general introduction into the service is being contemplated.

A new method of bond ing new concrete to old was described by Mr Frank Barber, of Toronto, in a recent article in the Canadian Engineer This consists in placing bags of cracked ice on the last ces of concrete placed at night, thus reducing the temperature of the con crete and, consequently, retarding its time of set ting, so that on the next morning the surface is still plastic and the con crete then placed will set in one mass with the old The invention of this O L. Hicks, when he was contractor for a reinforced concrete truss bridge in Ontario As all of the members of these trusses is credited to Mr were of relatively small cross section the ice bags were easily placed in post tion, at the end of a day's work and it is stated that the method worked very successfully To what ex tent it could be applied to heavier work is not as yet knosn

Hitherto dew has been used as a beverage only in poetry, by the sun, flowers, and butterflies It has re-cently been robbed of all its postle character by be ing used for the refre ment of English soldie The English administra-tion at Gilbraliar, where water is very scarce, now collects dew by the follow ing very simple method A large pit is dug in the earth and covered with dry wood or straw which, in turn, is covered either with earth or with sheet fron The straw or wood serves as a heat insulator and effectually prevents from the ground to the layer of earth or the sheet

E. A. live of earth or the sheet iron, above Consequently this earth or iron cools after sunset much more rapidly than the ground so that its temperature soon falls below the dew point of the surrounding air Hence dew is formed upon the iron or the layer of earth in very large quantities.

The water thus obtained is drained off into reservoirs and after clarification is used for drinking

# MORNING AND EVENING STARS FOR 1910

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE

The popular expression 'morning and evening stars' while signifying those planets which at different periods illuminate our skirs, the observer will natur ally include in his study of the heav us the fixed stars name indicates that they will be invariably

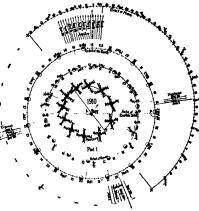
found in the same places on the coles tal sphere. Their positions in the ceres that sphere. Their positions in the heavens may be seconer fixed in the memory by first observing the stars of higher magnitude, whose conspict on brightness casily distinguishes them from those of varying degrees of lesser brilliancy in this way the heavens may be triangulated visually, and in process of time all the constellations may be easily identi-fied. For such observations a star map is indispensable, and the post-tions of the stars should be located by right ascensions and declinations which are given in the Nautical Almana. The position of the celestial equator from which declinations are measured may be determined ap-proximately by observing the stars which are near it on the star map, and in the same way the position of the first meridian intersecting the celestial equator at a point from which right ascensions are meas-ared, may also be defined. Following this method seven eighths of the celestial sphere (at latitude 40 deg.) will come within the range of vision, and the heavens may become an "open book" The distances to the fixed stars are so great that ( x ept to the astronomer) their apparent positions are not disturbed when the earth reaches the opposite point in its orbit—a distance equal to about one hundred eighty six million miles. For purposes of observation the earth may therefore be regarded as

the unter of the celestial soliere around which the stars appear to revolve once in a sidereal day, which is mearly four minutes shorter than an ordinary day, a difference due to the revolution of the earth around the san once in 165% days. During this period the earth makes 3561; rotations on its axis. As a conse-quence the stars rise nearly four minutes (arilar every day, and during the year the major part of the celes tial sphere comes within the range of vision at any assigned hour of the twenty four. The positions of the planets are continually changing, and in or

der to discover the region of the honvens in which to search for them their situation rela-tive to the sun and earth should be determined as illustrated in Plots 1 and 2 plots of their orbits have been printed in the Me twith American in the Issue of the following dates March 17th, 1908, February 18th, 1908, and March 1907, February 18th, 1908, and March the 1908, and the positions of all the planets are shown for every day of each year. Toare anown for every day of each year. To-gether they exhibit the courses of all the plan-els for the five consecutive years from 1906 to 1910 inclusive. The orbits of the aster-olds which are between those of Mars and olds which are netwen those or many and Juplier, Saturn, Uranua, and Neptune, are too small to be visible to the naked eve, the largest of over six hundred being not more than five hundred miles in diameter. Several of he orbits are very eccentric and inclined at large angles to the plane of the ecliptic

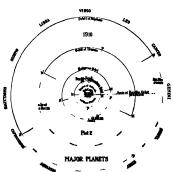
In order to bring the plots of the orbits of the planets within the limits of this page, the the planets within the limits of this page, the orbits of the terrestrist planets, which taclude Mercury. Venus the earth and Mars, age drawn to as large a scale as the space perdrawn to an large a scale as the space per-mits. Since the diameter of Neptune's orbit is thirly lines that of the earth, the plot of the orbits of the major planets, including Junius Ratura, Uranus and Neptune, are drawn to a sais which is very much reduced. In this pile the orbits of the arth and Marse of the orbits of the arth and Marse of the orbits of the arth and Marse attention to the contract of the arthur of the asteroids or minor planets and the arthur of the sacrodies or minor planets and the arthur of the large the rabos the continuity of the large that a the arthur plane of this ways rank to be the to correspond the

plane of this paper may be taken to represent that of the ecliptic or the earth's orbit, and if it be placed in n horizontal position a planet which is on one side may be described as being situated above and on the other side as below the celliptic. In the plot of each orbit the full line represents that part which is above, and the dotted line that part which is below the and the dotted lite that part which is below the ectip-tit. The seconding and descending nodes N and N are respectively the points where the planet passes from the space below to that above, and from the space above to that below the ecliptic, and P, the peribalics,



is the point of the planet's nearest app A line joining the points N and N', the line of nodes, is the intersection of the plane of the planet's orbit with that of the ecliptic To avoid confusion, only a portion of this line is represented, except in the case

It is obviously impossible to represent the diameter of the planets by the same scale. Even those of the giant planets Jupiter and Saturn would shrink to mere The same may be said of the sun itself in Plot



PLOT IL .-- PLANETARY ORBITS.

2, but in Plot 1 its diameter (\$66,490 miles) would be and the riot i its channels (\$66,600 miles) would correctly represented by a measurement a little methan one-half of e, which is the linear eccentricity the distance from the sun's center to the canter of the can earth's orbit

The earth's mean distance from the sun (929 milli miles) is diminished by a little over one and one-million miles at perihelion in January; and increby the same distance at sphelion in July The center of the orbit is at a. At a velocity of 18.5 miles per second the earth moves each day on the average nearly 1,500,000 miles, with an increase of velocity at perhelion and diminution at aphelion; making the complete revolution in 365% days. The

position of the earth is shown at in tervals of four days at Greenwick, noon, and intermediate positions and dates may be interpolated by subdi-

The plane of Mercury's orbit is in-clined at a greater angle (7 deg.) than that of any other of either the terrestrial or major planets. Its-co-centricity is also greater than that of any of the planets. By the eccentriccenter of the orbit to the sun (the linear eccentricity) divided by the semi major aria The linear eccen tricity is 74 million miles, and the length of the major axis is 72 million miles. Mercury's mean distance from the sun is therefore thirty-six million miles with a diminution and is of 74 million miles respectively at perihelion and aphelion At perihe-lion the planet moves at a velocity of thirty five miles a second, which is diminished to twenty-three miles a second at aphelion Mercury's orbit is a marked illustration of the first two of Kepler's three laws First The orbit of each planet is an ellipse, with the sun in one of its foci The radius vector (1 e, the orbit radius whose length is continu-ally changing) of each planet desoribos equal areas in equal times. For example, the area of the triangle with the sun as its vertex, and with a base equal to that part of the orbit

a base equal to that part of the orbit included between the dates of August 30th and Sep-tember 7th, is equal to the area of the triangle with the same vertex and for a base that part included be-tween the dates October 9th and October 17th In cen formity with the second law, the length of the base of the triangle is continually diminishing from perihelion to aphelion, and increasing from aphelion to perihe

to aphelion, and lacrossing from aphelion to perfile
lion, which accounts for the might variation in the
planet's velocity. Merry's revolution around the an
a accomplished in very nearly eight-yeight of
(87 97). This is repeated over four times
during the year, and four dates are attached
to each position. Owing to the great variation
in the planet's velocity the positions are
shown for every second day.

VENUE The orbit of Venus is inclined to the plane of the ecliptic at an angle of 34 deg. The occentricity is less than that of any other planet, and is barely visible in the plot, the distance from the wun to the center of the orbit is less than a half a million miles. As a consequence, the velocity of the planet in its orbit at a mean distance of 672 million miles orbit at a mean distance of 873 million miles is nearly uniform at the rate of 219 miles presented.

The period of revolution is 2247 days. The dates outside the orbit are those which belong to the first revolution, these within, to the second revolution, and that part of the orbit included between the positions of the planet for the first and second those of the planet for the first and second travalutions. revolutions represents the distance traverse in seven-tenths of a day

MARS The orbit of Mars is inclined at an angle of 1.85 deg.; and the center c is 13.2 million miles from the sun. The mean orbit velocity is fitten miles per second, and the mean distance from the sun is 141.5 million miles. The

period is 1.85 years.

The inclination of Jupiter's orbit is 1.8 deg. with a linear eccentricity of 22.3 million miles.

The inclination of Jupiter's orbit is 1.8 deg. million miles.

The state of the

# CURIOSITIES OF SCIENCE AND INVENTION

#### A STREET BAILWAY AUTOMOBILE

bile street railway has recently been installed for regular passenger service between Manda-ville and New Orleans, La. The cars are each fitted



A STREET BAILWAY AUTOMOBILE

ing them practically automobiles on rails. The line is ing them practically automobiles on rais. The line is 16 miles long, and steam motive power has been in-stalled in order to reduce the cost of maintenance. Two street automobile cars built as an experiment have proven so successful that more are now under Each car is built to seat twenty-two people, and the expense of maintaining the line under present power permits of a large saving over the ordi-nary electric street railway maintenance.

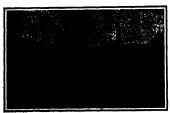
GALILEO'S TELESCOPE.

Just about three hundred years ago, Galileo exhibited a telescope which he had used in studying the moon and planets. This was not the first telescope



THE FIRST ASTRONOMICAL TRABSCOPE.

awe rount, out it was neveror to a risk tenecopy as be used for satronomical purposes. The accompany-ing engraving shows how the telescope locked. This type of telescope differs from the present astronomical type in using a concave instead of a convex eyepiers, so that by a combination of but two lenses, the object glass and eyepiece, he was able to view objects right



SOSSEE PROPERTY BY MOTOR-BRITER SPURSED WHERE.

side up, whereas in the present astronomical tale-scopes objects are inverted. The Galilean type of tele-scope is now used in the ordinary opera glasses. With this crude instrument Galileo was able to establish the fact that the moon is a round body with its surface broken by mountains, that the Milky Way is com-posed of countless stars, that Venus and Mercury have phases like the moon, and that Jupiter has a number of satellites (four were discovered by Galil him Saturn appeared to be a triple planet. This pus-sling phenomenon was explained fifty years later by Huygens, who discovered that the planet was surded by a flat ring

AF EGG WITE A TAIL.

Occasionally, for one reason or another, a hen will lay a "soft-sholled" egg, but one with a tail, like that shown in the accompanying photograph, is decidedly unusual This egg was evidently the last or



AN EGG WITH A TAIL

a clutch, and, though the hen lacked material for a shell, she had a surplus for the shell lining, or egg

#### A FROEEN TELEPHONE CABLE

A PROBEN TALEFRONE CABLE
The accompanying photographs shows the effect of
ice pressure on a twenty five pair lead telephone cable
The cable was located in a three-inth iron pipe, and
was run underground for fifty feet between the terminal pole and the manhole in the street. Owing to a fault in the construction of the lateral, the pipe di not drain into the manhole, which allowed water to collect in the pipe for a distance of about twenty feet.



THE REFECT OF ICE ON A TRLEPHONE CABLE

Last winter being an extremely cold one caused this water to freeze in the pipe, the pressure crushing the cable out flat. In several places there was a quantity of small stones and gravel in the iron pipe and so strong was the pressure of the ice in the pipe that strong was the pressure of the fee in the pipe that these stones were forced into the armor of the cable as though driven in by a hammer. The wires had the numal paper insulation, and the extreme pressure forced the wire through the paper at every twist of the conjustion. The cable was denied and crushed for a distance of twenty feet.

#### MOTOR SCOOTERING.

Some years ago an amphibious craft was invented at Great South Bay Long island which could be maneu-vered on ice as well as in the water. It was in reality an icebest provided with a flat-bot-

an icross provided with a finitoric tomed hull which would font the craft in case of oncountering a blow-hole or break in the ice. The sport proved to be very fascinating, particularly the peculiar sensation of plunging off the ice into the water and then climbing back again The and then climbing back again The "secoter," as this craft is named, is now undergoing further development, Instead of depending upon the sail for power, Mr Nat Roe of Patchogue, L. I. has equipped his scooter with a 30-horse-power motor and a surveyed wheat which dies and a spurred wheel, which digs into the lee and drives the craft along He claim to have traveled over the lee at a rate of 90 miles There is no mes propelling the boat while in the

water, but the sport consists in leaping gaps in the tee by the sheer momentum of the craft. H The seaped gaps of over a numered fort in this way. The motor scooler possesses and advantage over the motor sled, because it cannot sink in case of breaking through the lee, and over the sail scooter in the fact that under its own power it can be taken home over snow-covered roads when the owner knows (itsed of

#### LARGEST PROJECTILE IN THE WORLD

The accompanying illustration is of more than ordin ary interest from the fact that it shows the largest



LARGEST PROJECTILE IN THE WORLD

and heaviest projectile to the world being the bugg 5-foot, armor piercing shell fired from the United States governments great is inch rifk. Phis giant d powerful gan are considered two of the r such and powering that are consumered two or the mone-destructive and dendly engines of warfarr in exist-ence. The monster (b-link) rifle the only one built so far is now at the Sandy Hook Proving Grounds, and has only been fired a two times. The huge shell of trade of the best of the control of the of steel can be huried a distance of 20 miles or mor and weights 2 100 pounds. The powder charge is nearly 500 pounds. The cost of firing one shot reaches in the neighborhood of \$1000 its not probable that this type of gun will be used but rather the 14 inch for the main coast defences of the Panama (anal and possibly the Philippines. This formidable and long range weapon though capable of firing so tremendous a projectile is too costly and files too slowly for modern

INTERLOCKED MOOSE ANTLESS

A curious relic of a fatal battle between two built moose is shown in the accompanying fillustration. The battle was fought in the Kenni Peninsula Alaska a few years ago. An indian was attracted to the spot by the noise of the encounter, and on nearing the two antagonists he found that one had broken its neck during the struggle and lay dead on the ground while the other partly exhausted was making desperate of forts to free his horns. After killing the latter moose the Indian tried in every way to separate the antiers but found this to be impossible. The interlocked antiers are soon to is exhibited in the collection of heads and borns in the new Administration Building of the New York Zoological Park. The larger pair of horns has a spread of 69% in hes and the other of



RELIG OF A BATTLE BETWEEN TWO RULL MODE

# THE DESIGN FOR THE NEW QUEBEC BRIDGE

COMMONPLACE IN APPEARANCE AND COSTLY TO BUILD

The collapse of the hope and lies or bridge at Quebe on August 24th 1967, was at one the structured and mant fatal admeracylate in all the library of bridge construction make not or modern. When that collosed structure broke down under the own wight and disposard from shigh the his Vane run. River more than rights homosa lives and only of structure. Nature that the shight has been all the same for distinction. Nature that the shight has been distincted by the shight has been distincted by the shight has distincted by the shight has distincted been could be shade, could be shade could be read earlier of the structure of the shight has of prestigate to the rather when were commerted with the work, and distinct the shight has been shighted by the shight has great promising to of the bridge was due to the fact that it imbuilted the longest span (1,00 feet) yet accurately of This was longer by 30 feet than either of the shight in the shight in the shight in the largest leither in the shight in the shight in the largest leither in the shight in the shight

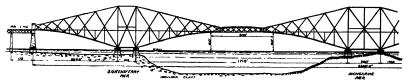
An investigation of the facts by a Royal Commission revealed as the cause of the collapse faulty design of the compression members—it was ascertained that the slightest attempt to combine the beautiful with the useful The faulty structure with collapsed had at least the redeeming feature that the outlines were structurally and sathetically correct, and although the both Bridge has been made the subject of much crititism by the arrist and the architect, it must be regarded as having distinct claims to beauty when compared as on the arcompanying page, with the new plans for the quebes Bridge

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It would seem, however that the Board has some
double as to the meritar of its own work, for its
will competite the transport of the own work, for the
next the contractor's own exposes. But if the Board has
taken eighteen months' time and spen, it 10,000 to preduce the present plans, the public will naturally safe,
If ow can the Board oxyper temporabilité firms to fur
high them with new plans in one-sixth the time and
for nothing?

The lay of the land at the Quebec crossing is such as to make it almost certain that a thoroughly rigid

pressure during high gales, and particularly is this provision necessary to insure safety during srection. The bridge which failed was only 87 feet what data small width was a large contributing cause to the viriting of the structure during exection, which precided its collapse. This important fact does not seem to have been given sufficient consideration, for the new structure has a width of only 88 feet, or one to still the proposed length of gane of 1,78 feet, as against one-fourienth in the Forth Bridge it may be included that carrentees with American.

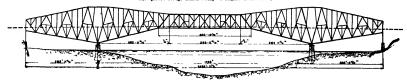
It may be cialmed that experience with American practice in centilever pailmed bridges has shown a proportion of 1 to 20 to be sufficient, but it is a question how far their immunity from disaster during erection was due to the fortunate circumstance that strong winds were experienced—such as frequently occur at the Forth Bridge, and may occur at Quebox—which south have twisted IN transes out of shape-bridge they had been therefore the dark three of the property of the control of t



One-half of the cantilever bridge, Firth of Forth, Scotland; completed 1890.



The Quebec bridge which collapsed August 29th 1907,



The unsightly structure new proposed by the Canadian government for the Quebec bridge.

#### THE DESIGN FOR THE NEW QUEBEC BRIDGE

management of the work was so badly organized, that the blame could not be definitely fixed in any one quarter, and in the end the Canadian government had to assume the whole money loss. The work was cern culty! taken over by that government, and it was declided to rebuild the stravium. For this purpose a commission of these engineers was appointed, and it was publicly amounted that the new bridge would be the finest and divergest stravium of the kind ever

The Commission was appointed about eighteen months ago. In the interior the preparation of the plans has cost about 1310 000, and as the result of its eighteen months work the Commission has produced to very commonplace design, howevith illustrated, re, aarding which there is a general professional opinion that both structurally and esthetically it is distinctly interior to the Porth Bridge, which was completed nearly twelly years ago.

If the bridge is built according to the proposed plans, it will not only be of inferior merit, considered from the bridge contineers standpoint, but will also be the ugliest bridge of monumental proportions among those bitherto proposed or built. It presents the speakness of a monotonous menho of triangles and straight lines. From shutment to abuttment there is not one graceful line in the whole structure, not the

suspension bridge could be built more cheaply, more quitkly and with lear size of failure during evention On the other hand, if a bridge of the cantilever type is selected, it should be one of the first duties of the Board to see that one of the contributory causes to the wakeness of the bridge that failed, namely, its desired, that the samely, its selected, it should be one of the transition of the section of the section

dare run faster than 35 miles an, hour The vibrations, due to the narrow witht would become excesive, and at faster speeds would create danger of exrationest. On the other hand, the advantages of great width in proportion to length are shown by the fact that the fast and heavy express trains in the north that the fast and heavy express trains in the hoofing street, and the second of the street of the should nature over the Forth Fridge at their full speed of from 16 to 60 miles an hour

Another amount in the specifications upon which the are invited which is pussing segments and contractors is that the maximum height of the severy R really would some as though the board of sugments who draw up the appellentiams were desirons to put weight into the new bridge merely for the sake of having it there, for it well understood that the areas of the real three to the sake of having it there, for it well understood that the areas for the sake of having it there are not to the sake of having it there are not the sake of having it there are not the sake of having it the sake of having it there are not the sake of having it is sake the sake of having it is all fined, and it is the quicked for the parts Bridge in 185 fact, and it is the Quade for the forms and fine it.

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## A HOVEL AMERICAN MOSOPLANE.

(Continued from page 1 | 6) culated through the bearings and the crankshaft by a gear-driven pump A narrow Livingston radiator is mounted in narrow Livingston radiator is mounted in front of the motor, a short distance back of the center of the plane. Two torpedo-shaped gasoline tanks connect the two sets of front and rear uprights at the

sets of front and vear upragnts at the center of the machine. The single surface of this monoplane consists of seven sections—a central one and three on each side. Both the spars forming the front edge and the rear spar, forming the front edge and the rear spar. On these in advance of the rear edge, are divided on such side of the center section into three f-foot lengths. These spars are jointed together by sheet steel conclusion and are securely held in position by cables, forming a double post in treas and passing over the light goals to cables are attached to drill. The company of the various sections. These ribs are trussed by an inverted rib and drill red

ties. The formed of Baldwin's val formed of Baldwirk's valenaised Japaneses antileproof material, and which is colored black according to the funcy of Mc. Pfitners, is located on in sections and is hold to the ribs by feather bone and tacks. A section 30 inches long is left out at each end of the plane. This section is to be courseled by the silicity wing tip. These wings tips or equalitaries, and the section is to be controlled by the silicity of the section in the section of the section is the section of the sect which are 30 inches wide by 5 feet deep, have the sance curvature as the main sur-face, and are each formed of three ribs connecting a front and rear edge, which slide in a suitable track made of steel tube rails extending the whole length of the outer section of each wing, i. e., 5 feet, and allowing the sliding tip a 30-lach invasal by their nautral position those travel. In their neutral position these

wing tips extend 15 inches beyond the end of the wing proper When one is slid out the full distance (30 inches) beyoud the end of the wing, the other is drawn in beneath the end of the opposite drawn in beneath the end of the opposite wing. These tips are connected by a long cable, which passes over pulleys and is wound around the control wheel, so that when the wheel is turned to the right when the whose is turned to the right the left wing tip is fully extended, and vice verse. As the area of each wing tip is 12% square feet, when one is fully ex-tended and the other withdrawn, there is tended and the other withdrawn, there is a difference in lift at the end of the wings of about 50 pounds at 40 miles an hour, at which speed the machine lifts about 4 pounds to the square foot.

The horisontal rudder in front and the

tall at the roar are mounted on two trussed rods extending about 14 feet in front of and 10 feet behind the main plane The horizontal rudder consists of front of and 10 feet behind the main plane. The horizontal rudder consists of a main beam about a third of the way from the front to the rear edge, upon which the ribs are mounted. These ribs are connected together by a light front edge of wood and at the rear by a wire cable. The rudder is balanced. At its right end is a double vertical lover, which is connected by wires to a similar lever on the transverse shaft at the base of the on the transverse shaft at the base of the control column. The latter lever can be seen in the three-quarter front view of the machine. A forward and backward movement of the control wheel depresses or raises the borisontal rudder. The veritari rudder is connected to the control wheel fin such a way that when the wheel is notice to the control wheel in such a way that when the wheel is rotated about its vertical axis the rud der is set to turn the monoplane. The motion is the same as that used in steer ing a bicycle The vertical shaft of the ing in the supporting bracket, the trans-verse steering lever being just below this bearing Cables connect the ends of this lever to a similar one on the vertical rud der in order that the longth of these cables may remain the same during the fore-and-aft movement of the control wheel, the bracket at the base of the con trol column is arched so that the ends of the steering lever just mentioned are in the center line of motion. The cable that operates the wing tipe, and which is wound around the circumference of the steering wheel in a groove, is led by means of pulleys through the he of the control column It leave of the control column. It leaves the pair, lays in the control column. It leaves the pair lays in the consist line of motion, so that its tension is in no way affected by the interest columns of the control wheel. The threatist leaves for the carburdour is cable passes through the locations as cable passes through the location of the carburdour is and over pulleys to the carburdour a systic button for short-drevuling the magnato is also monated on one of the model of the controlling mechanism is extremely singulated with the controlling mechanism is extremely single and doubties will be widely used in It leaves the pulpie and doubtiess will be widely used in the future, as we understand it is the in-ventor's intention to give it to the public and not to patent it.

All the woodwork used in this construo-

All the woodwork used in the construc-tion of this monoplane is of spruce. The spars and strute are solid and have their front and rear edges tapeced, while the ribe are laminated With the exception of the motor, radiator, said grost cables, the whole machine is disalogh black and (Concluded on page 15L).





# Aeroplanes 🚾 Motors

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BUBBER STAMP MAKING — THIS article describes a simple method of mpking rabber strange with the second secon



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## INDEX OF INVENTIONS

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(Concluded from page 150) makes a very striking appearance Pfitzner has already made a number of short flights in which he was able to get off the show-covered ground within a distance of about 100 feet. The machine is very speedy and so far has shown ex-cellent stability. On one occasion it is very special and so far has sinon ex-cellent stability. On one occasion it whirled completely around when the ver-tical render was turned too sharply and yet. In doing this it kept a level keel and was not damaged. The running ear has been broken and will have to be much what stronger, but otherwise the ma thine has shown itself to be very strong ly and well constructed. The novel slid-ing wing tips used on this machine are agile different from the system of warp-ing the planes used by the Wright brothers, and from the first trial lights at least they appear to be fairly effective. Not until more extended flights have been made however can their true value b determined

## SHORELESS POWDER

(Continued from page 151) dry in some ways—the cotton being di-gested in centrifugal wringers of a sort gested in contribusal wringers of a sort akin to those in which clothes are wash ed. The atmospher is intensity acrid and the stranger coughs in the biting air, to which the throats of the operatives seem to be indifferent. When the cotton seem to be indirer at. When the cotton has soaked sufficiently, it shows signs of heating by cultiting a dense brownish smoke. It is then tumbled into vats of running water, and there, 'drowned before leing wrung out in another mechani cal wringer The cotton, before inno-cent has become an explosive in fact, is guncotion or pyro-cellulose its subse-quent stability and value as a propellant now depend upon the thoroughness with which all traces of the transforming acid

by Peel. T O'CONOR BLOAM!

As incompared theory of the heat torknow Board in the control of the Next the stewed cotton is taken to the pulping house, where it is pulped and poached like the materials used in paper making. The water is changed often, making The water is changed one-and after twenty or thirty hours work-ing, the "pyro is quite freed of the last trace of acid. These various operation, do not undo the nitrating. The chemido not undo the nitrating. The chemicat metamorphosus accomplished in the cotton by the acid is permanent, and the boiling and washings serve only to re-move spent and unabsorbed acid. The slimy pulp is now put through a "wet machine" coming from the rollers in flakes containing about 40 per cent of moisture. Thence it goes to the dehyd rating house, where all but a small per centage of the moisture is extracted by successive applications of pressure and, finally, by the use of alcohol which drives the dampness before it leaving just enough of the spirits behind to form the enough of the spirits behind to form the needful solvent when either is added. The ether is poured in and the stuff is ground and niked in a mechanical kneeder After half an hour's working the material resembles damp cracker crumbs Chuncally the pro is now solvent and has undergon unother change, requiring only the proper amount of pressure to produce homogeneity. The "colloid" for such it is is then pressed "coiloid" for such it is is then pressed into cakes wighing fifty pounds, which suggest soft rubber and are dully reson ant. The stuff is no longer white but looks like syrupy maple sugar. The amber-colored cakes are then subjected to a heavy pressure and the plastic stuff forced through steel collanders, whence

it issues in cords like solid macaroni Again, for the sake of more perfect union these cords are pressed into a single com-pact cake, and then the plastic mass is (Continued on page 152)







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Under an impelies of from 4,000 to 5,000 pounds presente to the square the 4,000 pounds presente to the square the same of these units and the number of parkets depending upon the caller of the same of these units and the number of parkets depending upon the caller of the same of these units and the number of parkets depending upon the caller of the same of these units and the number of parkets depending upon the caller of the same of

weapon.

The actual fashioning of the powder is now complete; but there are still things to be done before it is fit for issue shows to because over its its for issue the second of the by actual firing, and mixed with grains of other groups to secure a desired average, the powder is put up in air-tight tanks ready for issue. The object of careful sealing is to arrest the escape of the remaining solvent, which acts as a determinant and prevents the explosive from becoming too mick in fits hunning, thus coming toe quick in its burning, thus serving to check the development of sud-den and dangerously high pressures in

den ann mangerouse, the gun.
Smokeless powder can be dampened, and, provided it does not mildew, is as good as ever if properly dried again. After a nowder becomes eight or ten years the powder becomes unstable and even crumbles, but it can be sent back to the factory, be rework the semi back to the factory, be reworked, and turned out once more a good explosive at an outlay of only one-fourth of its original cost. This is proof of the Indestructible nature of its base-pure cellules—which however defect the canning of the chemist and holds secret the ways in which sampling of of the chemist and molecules the campaign of the chemist and molecules the ways in which amanine, oil, and receive the ways in which amanine, oil, and the work work mysterious differences in the minute calls of each elicitat filament. The cotton from Georgia does not make the aman powder as that from Alabama, and the blooms of Tennesses frew us the best and the blooms of Tennesses frew us the best proposed to a perfect and uniform powder. The proposed is the second proposed to a perfect and uniform powder. But he was a perfect with the minute and a sample of each lot is kept under continual independent of each lot is kept under continual independent of each lot is kept under continual index of each lot is lease, he was a language of a vital and the second index of the weards of the wayon. Here is a problem for the chemist. Rankelse powder is not an extending of the wayon. Here is a problem for the chemist. Rankelse powder is not an extending of the wayon. Here is a problem for the continual in the chemist. in which sunshine, oil, and atmor

of the weapon. Here is a get the chemist. Smokeless newser the chemist, finolesies powers as evaluating initial as ordinary simplewise, and cally initial as ordinary simplewise, and neither can it be detented in finish, and a small quantity of the old high propolesis as made quantity of the old high propolesis in the added to each champs, is indiffused but in added to each champs, it is indiffused in the added to each champs of the contract of the contr

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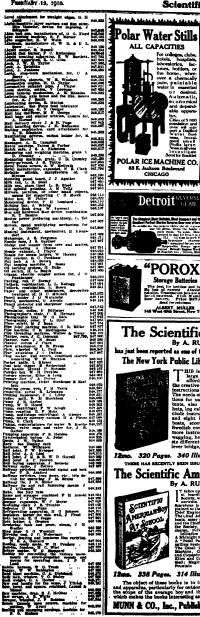
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(Concluded from page 154.) inflammation This explains the thin well of smoke now seen when our guns are

MORBING AND EVENING STARS FOR 1910.

(Continued from page 146) ity in its orbit is 6 miles a second, and the period is 29 46 years. Saturn's position is indicated at intervals of sixty

days.

The plane of the crist of Uranus is in clined at an angle of 0.77 deg to the celiptic, which is less than that of any of the other planets. The mean velocity of the other plants. The man winsty is 4 2 miles per second at a mean distance of 1.7319 million miles. The centry of the orbit is 826 million miles from the sun. The plant completes its revolution in 84 of years, and its position is shown at intervals of 120 days. Neutron's orbit. is inclined at an angle of 18 deg withstanding the planet's great distance the linear eccentricity is only twenty five million miles The orbit velocity is 3.4 miles per second, and the mean distance is 2,7916 million miles. The revolution is accomplished in 164.73 years, and the planet's position is shown at intervals of 180 days.

Neptunes distance from the sun is a very little over thirty times that of the earth  $\left(\frac{2.791}{92.9} - 30.055\right)$  The square

root of the cube of this number gives the root of the cube of this number gives the period, which is 16478 years. This illus-trates Keplers third law, vir. The squares of the periods of the planets are proportional to the cubes of their mean distances from the sun. By simular com-putations the relations between the peri ods and mean distances of all the planets may be shown to be those which are here given

NOW TO DETFEMENT THE MORNING AND

A planet whose orbit is within the carib's orbit is morning star between inferior and superior conjunctions and evening star between superior and in ferior conjunctions Prior to conjunction a planet outside the carth's orbit is even ing star, after conjunction it is morning star It should be noted however when a planet is near conjunction, it is not far enough away from the sun for observation. The longest arrows indicate the directions in which the major planets are seen at opposition, the shortest ar rows the directions in which they would be seen at conjunction if the sun were out of the way. At the date of opposition a night, and is therefore both morning and ing star

If the page he turned about one-quar it the page be turned about one-quar-ter of the way around so that the earth in Plot I on January 8th (the date of the opposition of Neptune) is between the reader and the sun the positions of all the terrestrial planets on this day may be seen without turning the head. The earth rotates in the direction of the ar earth rotates in the direction of the ar row At sunrise an observer emerges from the shadow area at sumer he can term if All plantes which in the plot are on the right rise before the sun and are morning stars, those on the left the after the sun, and are overling stars. On Janu ary 5th Neptuces is above the horizon morning and evening stars. Confinetion of Uranus with the sun occurs on the 11th Previous to this date Uranus is evening star, and subsequently morning evening star, and subsequently morning star On January 7th Saturn is at quad

rature, and is evening star On January 4th Jupiter is at quadrature, and is morn-ing star On January 17th Mars is at quadrature, and is evening star Or January 25th Mercury reaches inferior conjunction Before conjunction the planet is evening star and after conjunc planct is evening star and after conjunc-tion it is morning star. During the month of January Vegus is evening star. The planet is at inferior conjunction on February 12th, and after this date is morning star. The table gives the dates of conjunc-(Concluded on page 154)

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of a conjunction or opposition may secertained by this means. It should noted that these dates are usually so where between these which are ; the plot and between Greenwich one day and the next.

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#### THE DESIGN FOR THE NEW QUEEN BRIDGE.

REIDER.

(Concluded from page 148)
low height of 290 feet necessarily increases the weight of a cantilever, and if used for the towers of a suspension bridge used for the towers of a suspension bridge would result in a flat extensity, requiring unusually heavy and expensive cables and anchorages. The great height of the tow-ers and trusses in the Forth Bridge has rtant bearing upon its rigidity under fast trains

The effect of low height and narrow width in raising the weights is shown in the fart that the amount of steel to be the fart that the amount of steel to be put into the Queber Bridge in a length of 2,800 feet is estimated at over 66,000 tons. The total amount of steel in the Forth Bridge in a length of 5,300 feet is Forth Bridge in a length of 5,300 feet is 53,000 tons in other words, the narrow Queboc structure would require the en-ormous average amount of 24 tons of steel (about half of which moreover is nickel steel) per lineal foot, whereas the wide and rigid Forth Bridge required aff average of only 10 tons of carbon steel per lineal foot It is true that the train leads assumed for the Queber Bridge are about three times as heavy, but it is well understood that the weight of ste bridge of great span does not increase in anything like the same proportion as the live load

#### NEW OVERHEAD ELECTRICAL COMPTROS. TION ON THE NEW HAVEN BAILBOAD.

(Continued from page 140) building, through the Westinghouse Com-pany, an experimental freight locomotive, preparatory to operating its whole service, freight and passenger, from New ice, freight and passenger, from New York to New Haven, a distance of between seventy and eighty miles, entirely by electric power

At the time of its construction the

present twenty three miles of electrified line between Woodlawn and Glendale, present twenty three miles of electrified into between Woodinary and Glandale, the most couragous and costly experimental works ever understaken in the broad field of electricity. The story of the unparalleled difficulties with which the company had to contend in developmental works and at the same time howely and at the same time howely make the profession of the world has been told from time to time and in considerable detail in these columns. Today this electric same is running with the requirity of a that the delays through breaken or the electrical locomotives are shown by the statistics of operation to a 100, per cont loss than were the delays made open.

out less than were the delays under open-ation by steam loomodifue.

The experience gained during the past two or three years has revealed to the sugmorrs some features in which the elec-tric plant is capable of improvements. Per-ticularly is this true of the everhead (Ossofeded on page 485.)

partie. RE as no business open-tal, so profisible, clean, partial, so profisible, clean, partial, so profisible, clean, partial, so profisible, clean, partial partial passenger outcombiates (RAPIDS carry from 12 to 20 people, they will run on any road and clean a 1796 hill, they are very easy to operate and cost faitle to run.

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to of the matter in this book, has never before solidated as, for instance the waveur drying programing processes, the making of adjust ca condensors, the construction of interlock reversing switchers, the construction of interlock reversing switchers, the extended of materials, set constants and purchase of materials, set constants are processed on materials, set constants are processed on materials, set constants are set to be complete with a set of the constant of the co

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(Concluded from page 15) work, which in the existing line is of a massive and decidedly coatly type of construction. In addition to its expensive nature, the present overhead line was found to have unnecessary rigidity, and it was decided that before extending the work to New Haven it would be wise to ilid a fulle of experimental line, dying the improvements suggested by pouting the improvements suggested by past experience. We present two photo-graphs and a diagram which clearly illu-trate the character of the new work. In the old construction the line is carried upon massive steel bridges, spaced 300 feet apart, each bridge consisting of a pair of columns supporting a lattice trush which spans the four tracks. Each trol ley wire is hung from a pair of steel 'incasenger' cables by means of a series of triangles, the messengers being huns in a true catenary and fastened to insula tors attached to the top of the latticed The trolky wire, which is main tained in a horizontal position passes betained in a northootal position passes below the supporting trusses. The whole
of this system—messenger cables, tri
angles, and trolley wires—is charged with
current at the high potential of 11 900

was made not only to lighten the con was made not only to ingiten the con-struction, but also to provide one whose appearance would be lighter and more graceful. Furthermore, the cables and wiring have been so arranged that the main carrying cables and the main pipe hangers are not charged, and the only live portion of the work is the catenary trolley, and contact wires By reference to the engravings it will

be seen that the place of the massive bridges is taken by a pair of relatively slender tapering, columns, which are curved inwardly until they terminal above the centers of the outside tracks. To hold the columns in a vertical position and hold the columns in a vertical position and prevent their sagging under the load of the cables a length of steel pipe trussed with wire, is introduced between the op-posite incurving ends of the columns. The duty of carrying the wiring falls upon two 11, inch steel wire cables which are secured at the ends of the latticed columus, and extend continuously through out the whole line 13 pending from these cables at intervals of 100 feet are a which is hung from the cables above by which is suight rout the curies more upon two pairs of supports formed of 1½ inch pipe. All of this construction thus far described, columns, main cables and main pipe hangers, is at all times dead none of the current bring allowed at any time to pass through it—a feature of the greatest importance when it comes to the question of making quick repairs to the line, or of adjusting the set of the cables Attached below the transverse horizontal members of the pipe hanger are four por celain insulators, which are adjusted so as to lie vertically above the four tracks, and this feature of adjustment is one of the great improvements of the new over the great improvements of the new over the old line Upon the insulators are strung the four steel track messenger catenaries, below whith, carried on short vertical pipe hangers of graduated langths, is the copper trolley wire. An 'nch or two below the trolley wire and supported theoretem by steel clips, is the steel contact wire, against the under side of which the collector shoes of the locomo tives bear with an upward pressure of about 25 pounds. The method of attachabout 20 pounds. The method of attach-ing the contact wire to the trolley wire at points intermediate with the points at which the trolley wire is itself suspended, provides a system of equalization which gives to the system an even faxibility throughout its whole length, and insures a continuous contact and a consequent freedom from sparking

The management of the electrical zone of the New Haven Ratiroad Company and ers are to be congratulated in Jis engineers are to be congratulated in having made such a marked improve-ment, both from the constructive and esthetic standpoints, over the existing line between Stamford and New York



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come from a faulty fire. How does your fire burn? Is it sometimes hot and sometimes not? Does it come up very fist and then lose its heat? Is the red flunc edged with blue? Is the coke formed dark-colored and crumbing? Do you have trouble getting good solid welds? Then-You're Using the Wrong Coal. You SHOULD USE

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3- A blue edged flume indicates sulphur. Webster Smithing Coal, being practically free from sulphur makes a pure red and yellow flume.

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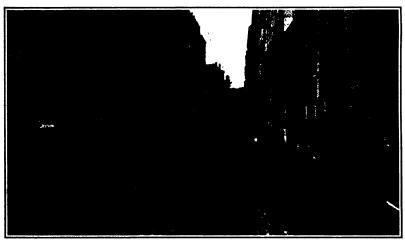




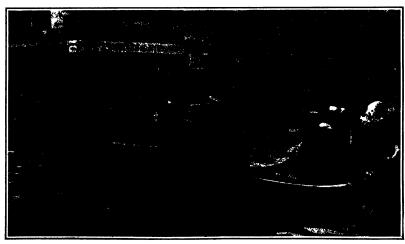


# A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CHI - No. 6. [10] NEW YORK, FEBRUARY 19, 1910 [10] ON A PAGE.



The Rue Surcouf was converted into a Venetian canal.



Soldiers and sailors amisting in relief work THE GREAT FLOOD OF PARIS.—[See page 164.]

#### Scientific American

whole range of active work in his Depar

## SCIENTIFIC AMERICAN

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NEW YORK SATURDAY PERRUARY 19th, 1916

The failter is aways to be receive for examination literated articles arbitrated of timely interest. If the photographic greaters, the article of and the facts entirelists the contributions will provide specification of the contribution of the co

#### SECRETARY MEYER'S PLAN FOR THE RECREAMIZATION OF THE HAVY

IIA1 one of the first acts of Mr Meyer on sunning the extremely difficult and respon sible position of Becretary of the Navy, would b to make a thorough investigation of con-ditions with a view to placing that very complicated department upon a more practicable working basis was inevitable as everyone must have foreseen who is familiar with the excellent work of reorganization which he achieved while holding the position of Post master the noral

changes introduced by Mr Mever are nece marily supplemental to the work of his predecessor Newberry who had formulated and put into effect a system of consolidation which, in the brief period a system of consolidation which, in the brief period of its operation had shown excellent results Mr. Mever has assured us that the changes which he has instituted in the Newberry plan have been made not for the purpose of reversing but rather of smpliffying the work of consolidation inaugurated by his prede The essential changes involved in Mr plan are summarized under the following heads

- pian are aummarized under the following nears

  (1) The provision of four responsible advisors (of
  the Secretary) on subjects within the groups into
  which duties of the Department logically fall

  (2) The grouping of the Dureaus into two divisions
- of material and personnel according to the nature of
- (3) The establishment of a Division of Operations
- (4) The establishment of a comprehensive inspetion system of a permanent organization whose officers shall be periodically changed who will come mainly from the active fleet and be conversant with the latest slips and the modern methods of drill and organi xetion
- (5) The establishment of a modern and efficient cost keeping system in the Navy Department and at
- navy yards. he separation of navy sard work into the two natural divisions of bull and machinery
- (7) He intends to require that commandants and toptains of pards for navy vards shall be selected for their knowledge and experience and that their tonure of office shall be long enough to insure continuous administrative policy

The Schatter Augustan has before it the printed record of the hearing of the Secretary and various Bureau chiefs before the House Naval Committee apnursus times score the House Vaval Committee ap-pointed to consider the proposed reorganization, and, after giving the same a most careful reading, we have come to the conclusion that with one very serious exception, the measures proposed by Secretary Meyer ar well adapted to promote that consolidation which Mr Newberry began and which the present Secretary he was not you and whom the present secretary is endeavoring to place upon a lasting workable basis. The appointment of four addes, independent of the Bureaus whose duties will be to inform and advise the Suretary on matters coming under the four gen eral heads is an excellent arrangement the need for which had been keenly felt by previous secretaries.

The Aides for Operations of the Fleet, for Personnel. and for Inspections are to be line officers. The ques-tion as to whether the Aide for Material should be chosen from the line or staff is left open. We are decidedly of the opinion that in seeking for advice on decided in of the opinion that in seeking for advice on the question of maintrial that is abige, sendors many works of the Streetery should have a bit and to be the property of the properties of the properties of the py training and experience is been qualified to advice upon these subjects. A proportion of three line officers to one state officers among the allew would give a fuir representation of both branches of the service, and would not the Serveirry adequately in touch with the

The feature of Secretary Meyers plan which we consider to be open to very grave question is the proconsider to be open to very grave question is the pro-posal to sentrate the navy yeard work into two distaines of hoil and machinery, with a separate and indepen-dent manager for each for the change involves the electron of the navy pards, namely he securing of efficiency, and the avoidance of contraston and delay, by planing the shole of the work affecting the con-struction of the ship in shares or the contrast of early of the sole of the very many than the con-trast manager of the yard. Mr. Meyer recognizes that a navy yard is a military establishment and must be under military questioned but this condition was

that a new yard is a ministry entorshalled and thus be under military government but this condition was not under the Newberry plan by placing at the head of the yard a commandant who is always a line officer et the yard a commandant who is sivenya a line officer of high rank Under him came the manager, a naval constructor whose executive powers were recognized ac covering not the military, but the industrial side of the work. In view of this distinction, we fall to see how the management of the yard as to lise non rillitary and purely industrial features by a staff officer of the management of the yard as to lise nonsee now the management of the yaru as to us more initiative and purely industrial features by a state officer of the naval construction corps is, in any possible sense a violation of that law of Congress, as cording to which a staff officer cannot exercise milit iary command over any other than members of his trea going) officers of the Engineering Corps, who were temporarily assigned to the steam engineer ing department at the navy yard were subject to the haval constructor manager, purely in the industrial and not in the military sense

If it is advisable for economy and efficiency and the consensus of evidence is overwhelming on this point, that the navy yards should be under a single indusmanagement and that this management should rest in the naval construction corps, and if under such an arrangement any legal question is involved as to the right of the constructor-manager to exercise non military authority over engineer officers of the line who may be temporarily assigned to duty at the yard then the sonner the law is modified the better for the interests of the navy, and of the American people as

If it be asked why both hull and machinery sho be placed under the control of a single head, and that isad the mayal constructor we reply that the bull and the machiner, are marely subdivisions of one organic s hole and that the two are so greatly interdepende an to make it necessary that their design, construction and submount result be under the management of a single corps, who are qualified for the work by train ing, knowledge and practical experience You. we the statement without any fear of successful contradiction, that the one body of men who combine the necessary knowledge of naval architecture and steam and electrical engineering to qualify them for the oversight of the construction and repair both of the hull and the markingry is the corps of naval con structors Unfortunately, much of the evidence which las been given before the committee has been directed to proving that the naval constructor is ignorant of steam and electrical engineering and therefore not qualified to take charge of the shops devoted to these branches at the many yards. That nothing is furthe from the truth is shown by the following consideration of their training and experience

In the first place the naval constructors are the pick of the Naval Academy graduates. They are selected from the highest numbers in their class and, as a have been taken from the first two or three purking the selection in addition to their academic standing careful consideration is made of their standing carried venisideration is made of their gen-rial aptitude for the service as shown during their three or four years at sea, of their general officer like qualities, and of their aptitude for the handling of men, and for general administration. The principle of selection is the same as is followed in the case of that other highly specialized and most efficient body of professional men, the corps of orginares of the After their education as line officers at ses Bring the constr Institute of Technology a post-graduate course in naval construction, which is the most thorough of any in the world

Furthermore (and we cannot too strongly insist that the impression that the naval constructor is fied steam engineer is absolutely erroneous) the course no steam regimer is associately erroneous) the course as the Massachusett institute of Technology involves also thorough instruction in steam and electrical regimening during which the prospective constructura are given a course of practical training in the lacking shope and laboratories of the institution. The life work of the navel constructor will be done

on shore and mainly at the various pavy yards, and on store and mainly at the various may yards, and by virtue of his long residence at these yards, or as inspector at the various private shipbuilting yards, he achieves an over-increasing and immensely valuable knowledge of the operation of these great industrial points. Future promotion and distinction for him is aiming these lines. There is every incentive for him to become thoroughly predicted.

Withighe line officer, however, into whose hands Mr. Meyer's plan would commit the construction of of the large and elaborate plants at the navy yards where this work is done, the case is entirely different. After his four years' course at Annapolis, the pros-lective naval engineer goes to sea with the expectation of spending practically all of his time affect, and, naturally, his sympathies, interests, and above all his ambitions, will be connected with sea duty. An as-signment for service ashore is merely a break in the routine of his chosen life work. If the line officer be an engineer officer, he will enlarge at sea his knowledge of the care and operation of a ship a machinery, but since by far the greater part of his time is spent his opportunities for becoming acquainted with the complicated and difficult work of managing such large industrial concerns as the steam machinery shops of the navy yards are, in the nature of things, very itr d His work is to run not to build, the engines, just as it is the work of the captain of the ship and not to build the hull.

on when the line officer is ashore, his interes Eyen when the line officer is assore, his interests and future sims are still upon the sea, and, as a rule, he is only too glad when the next assignment for sea, duty comes. Proof of this is found in the fact that during the past six years there have been at our sever kading naval yards, no less than 29 commandants and 41 captains of the yard Evidently, the sea-going office t too quickly got back to his natural sph

If there were available at the preof engineering officers who, like the naval constructors, bad been specially trained for shore duty in the man-agement of the machinery shops, etc. at the navy yards we would have more hope of the success of this siar part of Mr Meyer's plan, but outside of a few of the older engineers, trained under the system which obtained before amalgamation no such body of men is available. Furthermore, it is our conviction that were such a body existent it would still make for economy and efficiency, if both hull and machinery were placed under the single manag

That part of the Newberry plan which affected the ant part of the Newberry pian which are tell the navy yards was giving very promising results at the time Mr Mojer took office. We have little doubt that his determination to separate hull and machinery was poverned largely by certain alleged instances of facepacity of the naval constructors in their man Secretary, most of them over the signature of the Engineer in Chief The testimony before the House Naval Committee now before us however shows that a subsequent examination of these reported cases has clicited from the commandants of the various yards (all of them line officers) a complete disproval of the charges as made -a very gratifying vindication of the work of the naval constructors in this particular rework of the naval constructors in this particular re-gard. We cannot but feel that with this later evi-dence before him, the Bocretary will be disposed to reconsider that part of his otherwise excellent reforms, which proposes to separate hull and machinery and that he will allow the Newberry plan of a single management sufficient time to further demonstrate the conomy and all round efficiency of which it gave in the few months of its operation such great promise

#### LECTROLYTIC REMOVAL OF GREASE.

N cleerolytic method of removing grease from objects has been introduced in Germany Grease can be rapidly removed from metallic objects by employing it as a cathods in a hot solution of potant or woods by it was supposed that the alkall metals set free at the exthode transformed the fatty matter into soap, but Barth has now shown that substances which cannot be saponified, such as machine oil, parafine oil and parafine, are such as machine oil, paraffine oil and paramen, removed very quickly by the current, and be explains this fact by mechanical action caused by hubbles this fact by mechanical action caused by hubbles. is produced only when the fatty matter is liquid TI is produced only when the faity matter is liquid it is the temperature of the bath is too low so that the areas is considered. The rumoral is very also and it is not also that the areas is considered. The rumoral is very also and it is remarked solution of carbonate of potash bested between 85 and 100 deg. C. As the snode he uses sheet iron carbon pieces When a place of sheet iron rovered with oil or paradine is disputed into this bath it remains overeved with oil ten minutes after immersion when the current does not flow, but upon sending the current all traces of oil disappear in a few minutes.

To permit two steamers to pass from the Wisconsin River to the Mississippi River, near Prairis du Chieu, Wia, a railway bridge on the Chicago, Buritagio, and Quinoy Railway was raised by breakfows crance a few wocks ago There is no navigation on the Wis-conain River, but the two steamers were sent down to enter service on another routs. The railway cross the river near its mouth, and a \$5-foot span was red about 6 feet to clear the weamers' funnels.

#### Scientific American

#### ENGINEERING.

George W. Mcdwilla, Engineer in Chief of the United States Navy, states that there is every reason to litere that two ships of the navy will be ultited with the truth nave control of the control of the control of the truth nave of the control of the control of the front page of our last lause. It is proposed to recongline the "Battimers" with turbines of 12,000 horse-power and equip one of the new colliers with turbines of 5,000 horse-power, both employing this reduction gets

The number of persons killed in train accidents during the months of July, Austra, and September, 1909, as shown in reports made by the railroad companies to the Interests Commerce Commission, was 1848, and findured, 3,763 Accidents of other kinds including those austrained by supplyees white at work and by passengers in getting on or off the cars, et, , bring and 19,841 interest assenties up to 20 920 8452 killed and 19,841 interest assenties up to 20 930 8452 killed and 19,841 interest assenties up

The Shooboos dam in Wyoning, which forms the itselfing feature of one of the preject held for feature in the Service, has recently been completed. It is built for occurring an measures 232 4 feet from foundation to the creat. It is 175 feet long at the top and 85 feet long at the top and 85 feet long at the bottom, where the thickness is thickness in the feet. The reservoir back of the dam, which has a capacity of 485,000 acre feet, will serve to Irradian 138,000 acres of land situated about 75 miles east of the Velovasteen National Park

The grand total of casal excession at Fanama for the month of Desember was 2814 881 cubic part This is 382,386 cubic yards more than the total for November, but 1,088 686 cubic yards seen than the highest record made in March 1809 Of the grand total, 1,485,311 cubic yards was dry casavation. The removed printipally by steam showles. The drudges removed printipally by steam showles. The drudges reword 1,586 907 cubic yards in addition to the amount pumped into Gatun dam by the surtion dredges en agard on that Vision and the same of the cubic parts of the same pumped into Gatun dam by the surtion dredges en agard on that Vision and the cubic parts in the same pumped into Gatun dam by the surtion dredges en

In recognition of the culmination of his life work in the discovery of the North Pole, the Senate has passed a bill making Commander Robert E Pears are admiral on the rettied list. This signal recognition of the explorer followed closely upon the result to of the explorer followed closely upon the results of New York at white Pearsy received a sift of \$10 000 which, by the way, he immediately contributed to the proposal American expedition for the discovery of the South Poles.

Indigo Mason MP Patricks of the United States error, speaking on the subject of the construction of an artificial island and additional fortifications near the on trance to Chesappede Bay, drew attention to the fact that the two largest and fastest merchant venesis since thorse young least early 10000 men with all their mu nitions of war, and if runoposed, could land them our roast in loss than one week and he alias stated that more than one foreign power possesses a field of the more than the control of the co

Bereatary Meyer has soled for a large appropriate to suit the huge bettieahing non under construction. It is suit the huge bettieahing non under construction. If also make for the construction of a \$2,000,000 for force at Norfolk, for an additional \$1,000,000 for increasing to new dock at the New York navy yard to a length of 700 feet, for an additional \$1,500,000 for increasing the Puper Bound die kt an addit he 110 feet, and for the eablergement of the width of the Pearl Harbor dock, the West of the State of the State

The new terminal station of the Pennsylvania Rail road Company at 33rd Street and Seventh Avonus, Shahatian, is on far advanced that it will be practically complete the state of the state

Were Jules Verne with us to-day, he would be greatly

Interested in two instances of rapid travel recorded during the past week. A traveler from London to San Francisco won a wager by covering the distance in two hours and thirty few minutes isse than ton days, the trip beling made by the "Bauretania" to New Overland Limited to San Francisco. A passenger from Lima, Peru, in making a hurried trip in response to acit to London, left Lima the same day by stosmer to Panama, crossed by the Panama Ralivand; made close connections with a retomer for New York; and caught the "Stauretania" for England if the ship makes an average passens, the whole trip will have been co-

### AERONAUTICS.

The first excitosively aeronautic above to be held in America is open at present in Mechanics Building at Boston A score of full-stated representative acceptance of all types, together with a large number of mooties, are on river Several cogneticities for motion will be held, and some of the gliders and motor-driven aeroplanes may be fired out upon the ice of the lake in Frankin Field. This exhibition will give one a mod dice of the state of seronautics in the United States

On the John fastast Wilbur and Orville Wright very presented with the Langley median of the Smithsontan Institution by Chief Justice Puller at Washington Dr Alexander Granham Bell and Senator Henry Cabot Lodge made brief addresses Wilbur Wright an nounced that as soon as he and his brother pet the American company under way they expect to device the their time to reason the wind varieties. It is a second their time to reason the wind varieties in the world medials were designed by J C Champlain a number of the Prench Andelmy, the reverse being row metros of the Prench Andelmy, the reverse being row meros of the Prench Andelmy, the reverse being row meros of the Prench Andelmy, the reverse being row meros of the Prench Andelmy, the reverse being row meters of the institution, which was designed by St Gaudens

Paulsan has expressed a willingness to fig to the circlety of New York if Curties or some other interested person will have York if it Curties or some other interested person will have that injunction dissolved which now hange over the heads of avalators using avarable planes or hinged wing tipe. His brilliant success in Cultifornia lossed one to hepe that the desire may be Cultifornia lossed one to hepe that the desire may be Cultifornia on the Cultifornia of the

The first week of Pebruary the suit of the Wright brothers against Paulian for an injunction restraining him from giving exhibitions in his barraina biphane set thick before Judge Hand in the United States Circuit Court in New York (ity Judge Hand man letted great interest in the case and his decision is awaited with interest. It is uncertain whether be will grant a perliminary biguarion as lough Hand idld at Buffalo in het Devember — in defending the attack of the Wrights upon the Birton formation of Kr. K. Newill asserted that Froft S. S. Bionigomer's patient which medicates the Wright patient, every the same application of the Wright-Curless case and the text of Judge Hand is decision appeared in the current Superprise.

As soon as he had finished flying at less Angeles, Charles K. Hamilton went to San Diego, where he made a number of during flights with his Curtiss biplan On January 21d, after starting from the vast plain the Hotel Del Coronado Hamilton twice fice over the ocean so far that he disappeared from view for ten minutes. When he is appeared he came from a different direction. In the first flight he covered about 10 miles and in the second one 15 The u ind u au blowing at times as high as 20 miles an hour circling upward to a height of about 800 feet. Hamilton stopped his motor and made a wonderful long straight glide to earth. This is probably a record performance, certainly the longest glide ever made in America. week later at Bakersfield Cal he made two excellent flights under difficult conditions Starting from a half mile track, he flew about the town and out over the and adjoining oil fields, finally landing s fully at the starting point. His mastery of the biplane

Subsequent to the Los Angeles aviation meeting M Paulhan made avtilent exhibition flights at San Francisco, Danver, and New Orleans. At San Francisco, Danver, and New Orleans. At San Frantice on annuary 24th he made several dights an a strong wind the last and highest of which of 12 minutes duration, was made after sunset. Two days later he rose to a height of 1,300 feet in a flight of was mabled by a crewl of 3,000 people ager to see him fly After three pre liminary attempts, he finally left the ground and made two riccults of the course at Overland Park. The next day he made a 15-mile ferose-country flight in a driving now storm. In staring, he ran his Farman hiphase through anow three from the staring, he ran his Farman hiphase through anow are attracted the machine were in many places evered with more, white Paulhan himself was suffering from the preliminary riight of 8 miles. On Petruary 4th after certainty for the surface of the white the rectiling the Park successfully a dozen times, Phulhan trice was unsuccessful in starting in the distance at his disposal The first time one of the wheels of his machine struck the fence and was knowled off white he second time the makine crashed into the feace and was demolished Paulhan was subsurt, but several spectators were lailrod.

#### SCIENCE

The American Museum of Natural History in New York city has commissioned William Couper to model a status of Commander Robert E Parry for the Museum The statue is to be life size and of marble

In a bulletin issued by the United States Department of Agriculture Mr. Ned Dearborn writes on melant of destroying English insureous. The evidence of the insureous of the superiors to ever substitute of the insureous of the superiors to ever substitute or which reason some means should be adopted to theke the agreed of the hird. We Dearborn recommend the destruction of the needs from two to twitted days the destruction of the needs from two to twitted days throughout the breeding acases. Thus the number of English superiors could be reduced without resorting to state tools of time.

The Radium Entitlets of America has been incorporated in purposes are to study radium and radio active substances rays, and emanations in the interciso of a lone and humanity and to maintain a chemical inhormory library, meeting room and offices and call inhormory library, meeting room and offices and radium and properties perstaining to radium. The headquarters of the institute will be located in New Dr. Mitodas Murry Huttler, Charles F. Chandler: Berron Davids, William J. Olics, William Hallock, Eliwood (Iradius tingo Ileker Dr. Willy Myere thorage B inheredly of Pennsylvania.

An expedition to observe and photograph Italiey's comer from the Hawsilian Islands is to be sent on the the Martina for the Astrophysical Society of America in view of the possible privalentions arising from the close approach of the const to the earth onks, let and to Youne on May 16th to 18th meridian May let and to Youne on May 16th to 18th meridian in which the counst be sufficiently bright for that purpose. The close approach of the council to study of the poper The close approach of the council to the earth will afford an unusual opportunity for a study of the physical condition of counts IT be count to those grow inity to the sun at the time of maximum brilliancy impose services limitations upon the Notley's programmes. Whetey revended comperation will be resulted to the properties of t

The American Museum of Natural History has been presented with a filtester marker in faither of Mergia K. Josep by I. Plerport Norgan, It may be affelded debiers (Cevialant II. Dobge Charles Jarder J. Hampden Robb, Joseph H. Chont, and others: At the unvilling of the statue addresses were delivered by Prof. Observed was useded. Mr. Issey as president of the Museum) Mayor Onjon and Joseph H. Chosate.

Commander Robert ID Peary has contributed \$10.00 to a firmd for the outplying, and na American expectation to the Boarth Yole. This how for the transcending to contribute in the Boarth Yole. This how for the transcending contribution had been handed to both by four Highes on lockalf of the people of New York, as a testimontal of appreciation of his a histories in the finding the North Pole, and the Mercposition Opera House was revoked with people who had come to lake part in what the featering Civil Forum called a national restinontal?

There is a gaseous clement discovered in the atmosphere by Ramsay which is remarkable for its chemical inertress but though destitute of chemical properties it possesses a very curious physical property which was discovered by J. Norman Collic. When a scaled glass discovered by J Norman Collic When a scaled glass-tube containing mercury in an atmosphere of mean is shaken it becomes strongly hund nous Similar effects are obtained when other gases are substituted for neon but the light emitted by neon in these conditions is especially bright. If the shaking is repeated at intervals during two or three hours, the intensity of the light diminishes for a time and thereafter remains constant. The original lumi ordly can be restore d by passing an electric discharge through the tube. If one end of the tube is heated to 750 dcg F while the other end is cooled by immer sion in liquid air and the tube is then allowed to reordinary atmospheric temperature part which has been heated glows much more brightly than before. The luminosity is also greatly in massed by substituting a tube of fused quartz for the glass G Claude is endeavoring to utilize this remark able property of neon as a source of light and claims to have constructed neon lamps of an efficiency equal to about 1 watt per candle power.

# DID GREAT BRITAIN HAVE THE FIRST "DREADNOUGHT"?

THE "ROYAL SOVEREIGN" OF 1862

BY PERCIVAL A. HISLAM

The SCIPMITTE AMERICAN for November 20th, 1909, contained a description by Mr William Boernin Westmore of the U S S Roanoke' a converted steam frignic, which he claimed to have been the original frighte, which he claimed to may now not occurred principly of the Drandmught. The date of the conversion of the Reamon's from the frighte into the hirrestructed from the was 1853 hat England, the hirrhighes of the twentieth century Drandmught, here a similar instance to the Reamon's," but which dates from the previous year—1862

The 100 all fovereign as this ship was named, was built as a three-level sating ship of 3.144 tons and 120 guns and in 1880 had been fitted with engines of 800 horse-power. The sides of the 'Royal Sorresign' effer convenion were composed of three feet of solid lumber strengthened internally with disponal from bands and totaled externally to some distance before he asterline with 5.5 lish reliable errane plates One has he can be such as the contract of the cast of the side of the si The Royal Sovereign as this ship was nam

sides of the ship the deck shaped upward to the ourse circumference of the turrets, which thus appeared like circular forts on the apex of a glacis. The following description is taken from a contem-porary account in the London Times newspaper "Stop-ping on the Royal Sovereign's upper deck, we find that her light iron bulwarks, 3 feet 6 inches in depth are thrown down outward on hinged stanchions. On the creat of the deck stand the four turrets and pilot house, funnel casing, hatchways, and ventilating shaft The foremost turret standing five feet above the deck, The formost turret standing five feet above the deck, has its top covered by a grating, and is surrounded by a handrail, and thus affords a deck promenade for the officer of the waith or lockout man 'thu single-gun furrets are 4 feet a linches above the deck'.

It was claimed at the time that the method of mount ing and working the guns in the "Royal Sovereign" was superior to anything which had then been applied in any American turret ship in American design turret reated upon the upper deck, and was thus liable to many disablement, but in the English vessel the base of the turret was on the lower dock, and the cita del was therefore much less likely to be disabled by a hit. The American method resulted in the turnet being nine fret above the dock while in the "Royal Bovereign" only five feet or four foct three inches, as the case might be, was exposed to the enemys fire. Further, the latter ships turrets could be worked by rack and pinios inside the turret, by the same method son bars, as well as by steam

It will be seen that the "Royal Sovereign" bad four turrets—one more than the Roanoke", but she had one gun less, for while the forement contained two guns, the others had only one each. All the turrets were mounted on the center line of the ship, and the guns were muzzle loaders of 12% tone firing a 300-

The original spe d of the 'Royal So 12.25 knots, but after conversion this fell to 11, a difference which was fully accounted for by the in-creased immersion of three feet. Her freeboard re-



Converted British three-decker "Royal Se changed to an all-big-gun battleship in 1862 WAS THIS THE PIRST "DREADWOUGHT"!

mained at seven feet after conversion. The cost of the work was \$699.900

The "Royal Sovereign," besides having been, at a rate, one of the prototypes of the modern. Dread nought, is interesting as having been the first vessel in which the turret principles of Capi Cowper Coles were put into practice. The first vessel actually built in England embodying those principles was the "Captain," an ironclad of 4,272 tons, which capsised in the Bay of Biscay on September 6th, 1870

say of 1860ay on september etc., 1870
According to contemporary accounts, the speed of the
Roanoke' was only 5 knots 'This is inferior to the
Royal Sovereigns' speed by 6 knots The latter
temel again, had four turrets to the 'Roanoke's' three, both ships had 54 inches of side armor in a olled plate although up till then most American ships

had been armored on the inferior laminated system, both ships were practically mastless, for the three poles of the "Royal Sovereign" reached only just above the top of the funnel In freeboard there was little e between the two, while in the meth placing the turrets the British ship was decidedly

muon, therefore, as we owe to America in the de-velopment of modern navies, and more especially, per-haps, in the introduction of norm mavigation and in the correct placing of turrets in modern hattiships, it think it must be admitted that Orest Britain was, the first to possess a prototype of the modern "Dynad-mought."

nought."

I have been unable to procure a picture of the "Royal Sovereign" for reproduction, but the accompanying elevation and plan will convey an idea of the

purpling elevation and plan will convey an idea of the appearance of the skip.

It may be mentioned that Russia kunched in 1878 the "Admiral Lanared", a three-in-tracted tronclad of 2,776 tons, very similar in general design to the "Ros-noke." She carried in each trury two 13½-ton such but it was seen fit later to alter this to one 11-inch for each in view of the diagonal for echolos) arrange-ment adopted in the British "Drusdrought" cruisers of the livewiseld type, it is interesting also to note of the livewiseld type, it is interesting also to note the livewiseld type, it is interesting also to note of which the "Dullio" (1870, Great Britain following with the "United" in 1881, and with four other ships a the "Inflexible" in 1881, and with four other ships a few years later 'The only American examples of this system of mounting were seen in the "Maine" and 'Texas," the first with two 10-inch and the second with one 12-inch gun in each turret.

The arrangement of the turrets in the British

with one 13-inch gun in each turret. The arrangement of the turrets is the British 'Dreadnought' had a prototype in the French 'Advantari Dupers', launched in 1379 'Dis ship had 'devo turrets on the center line and on the same level aft, and a turret on each beam just forward of the fun nels. The guns had a freeboard of 27 feet 5 inches giving them a great command of fire Each turret contained one gun of 135 inches calibre, and if another content-into turret be added forward of the two beam turrets, it will be seen that the arrangement of the 'Dreadscought' is almost exactly reproduced It strangs how often we are controuted with the fact, in reading old books and other records, that there is reading old books and other records, that the

#### WORLDS SPAC OTHER

BY PROF. S. A. MITCHELL, COLUMBIA UNIVERSITY have systems around them possibly resembling our own solar system, and it is not outside the bounds of probability that many of the planets about these

or proceeding that many or the phanets about these distant sum may be inhabited by people who live and move and think Indeed, this earth of ours, of so much importance to us, is a most insignificant speck in the almost limitess universe.

If one should look at the heavens on any clear moon less evening, he would see them shising with countless orbs of light apparently millions in number—It is a fact that from our earliest education we have regarded the terms "numborless as the sands of the seasbore," and "countless as the stars," synonymous with quanti ties almost infinite, but if by the stars we mean those

that can be seen by the naked eye nd the expr sion thousands of years before the inven scope), our ideas at variance with the truth The un sided eve campoi see millions of stars as is com monly supposed, nor yet hundreds of thousands for at any one time ne could count only two to three thousand separate there are less than six thousand which can be seen with out a telescope. A

The second of the second

PROTOGRAPHS OF THE SPECTRUM OF A ORIGINAL JANUARY SIL AND SIL, 1986. The upper spectrum above a relocity of \$5 miles per accord away from the earth, and the lower one of 45 miles per second in the mane \$6

number largely, and with greater and greater tele-scopes more and more stars are brought to our ken it is estimated that the astronomer of to-day can see and photograph upward of a hundred million of stars. Each of these is a sun shining by its own light, the my tells us that thousands of these suns

Astronomers by their meridian circles have been able to measure the exact positions of these distant so-called "first" start, and have come to the content of the purpose a powerful telescope, and a man accounts operatorogo statched, whose temperature and them absolutely fixed in space. I. e. without mobile of them absolutely fixed in space. I. e. without mobile of the propose of

mous distances we are from them are however very small, and the changes of position in the sky so slight from year to year that they could not be found without the most careful measurements So from this point of view the stars are fixed, and the constain tions appear the same now as they did to the Challenge of the same that the control of the contr

none the less The old astronomy was able to measure motions athwart the sky, at right angles to our line of vision, the new astronomy is able to supplement this by a knowledge of their movem toward up or away from us in the line of sight. The reve-lations of this new branch of astron omy are revolution ary in their impor-tance, and of the greatest moment to of the Buirerse as a

> The principles underlying the use of the modern spec the stars are given r 25th, 1906. There

# CONCRETE CONSTRUCTION ON THE PANAMA CANAL

### HOW THE EIGHT MILLION CUBIC YARDS OF CONCRETE IS HANDLED

To the untrained eye the work which has hitherto been done on the construction of the Panama Canal necessarily appears more or less confused and chaotic Although over one-half of the excavation has been com-pleted, very little if any of the prism of the canal has been excavated to its finished dimensions, and the

works in the aggregate will probably represent the largest mass of mason; of any kind whatsover hithereto plared in a single engineering work of magnitude it is questionable whether an exception would have to be made seven in the case of some of the famous mason; requeducts built in ancient times, and the

Gatun on the Atlantic side of the Isthmus, one at Pedro Mignel and two at Miraflores on the Parific side, and the great spillines in the center of the Gatun dam for carrying off the surplus waters. All of the locks will be 116 feet wide by 1,000 feet long with a depth over the silis of 45 feet. The three locks at





Note the woodes forms in which the walls are molded Building concrete side wall-Gatun Spillway.

Sand cranes and puckets at Balbon

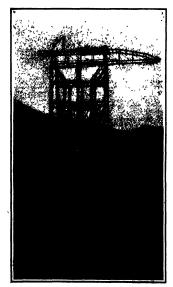
Some few months ago, however, the work of putting in the permanent concrete attructures began, and from new on this great work will begin to take on definite shape and present visual evidence of its massive and permanent character

The masonry works will not only be the largest of their kind ever built the locks and spillways being on a scale of unprecedented proportions, but these

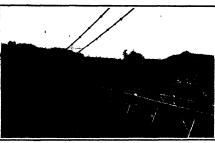
outline of the completed work is therefore irregular and ragged some few months ago, however, the work of putting are found in comparison with difficult by Some few months ago, however, the work of putting draulic works of the character of those on the Panama canal In the accompaning series of photographs, which were recently taken on the lathmus, one is able for the first time to gain some impression of the massive character of the concrete and reinforced-on crete structures the construction of which is now pro-

eding with gratifying rapidity cooding with gratifying rupidity

The concrete work embraces six hugo locks, three at Gatun will form a continuous structure which, with Gatin will form a continuous structure which, with the piers forming the approaches at each end, will have a total length of \$,800 feet, the whole work form-ing one huge monolithic mass of concrete. The Pedro Miguel lock with its piers will be 1800 feet, and the two locks and piers at Miraflores will have a length of 2 800 feet. Into the construction of these locks will onter about 8 000,000 cubic yards of concrete, and of this 800,000 tons will consist of cement. The spillway through the Gatun dam has been cut through a low



Huge emillerer crane for placing concrete at Fedro Mignel locks.



New 800-foot highway suspension across Culcbra Cut



to is brought from twenty miles east of the cane), atoms eranhers at Malhon.

#### Scientific American

all situated at about the center of the dam, and with in the excavation thus formed is now being laid the deep concrete flooring, the massive retaining walls neep contree norms, the measure remaining wans and the piers between which will swing the gates for regulating the hight of the water in that great art! ficial inland sea which will be formed by the dam. It can readily be understood that the economical

and expeditions laving of \$ 000 000 cubb vards of cou and expections laying or shown on cum yarns of on recte in structures of this magnitude called for a spe-cial plant of great size and capacity. At Gaira about 4,000,000 cubic yards of concrete will be employed The crushed stone the sand and the cement for this concrete is handled in the following manner crushed stone comes from Porto

Bello a small handet about 20 miles east of Colon along the At luntic const. The rock is taken from the quarry by steam shovels and sent by gravity to the glant ers, and thence by gravity to the barges in the harbor. From this point it is carried to Cristobal at the Atlantic entrance to the canal and thence the the old French channel, to the docks at Gatun Here it is unloaded into storage bins by giant grab buckets, oper ated from cablessays suspended be iween two sets of towers on either side of the channel

The sand is brought from Nom bre de Dios, about 40 miles along the coast from Colon It is taken from the sand pits by clamabell buckets, loaded into steel barges and taken to Gatun, where it is un loaded by a process similar to that of unloading the crushed rock. The ement is now being shipped from New York At Colon the cement is transferred to harges and taken via the old French channel to Gatun unloaded to the storage yard

and unleaded to the storage yards.
The rock and sand storage piles
have a capacity of about 300 000 cubit yards, while the
coment yard secommodates about 100,000 barrels From these storage buildings, the rock, sand, and ce nt are delivered through valves to charging car running undersually. These cars, which are electrically operated, curry the materials to the concrete mixing machines located nearer the locks' site and discharge it direct to the machines. After the crete is mixed, it is dumped into buckets set on flat cars, and the cars are run to position under the wide cableways spanning the locks' site and from these cableways the buckets filled with concrete are swung to position on the locks under construction

The general principles upon which the plant at the locks on the Pacific side is designed are the same as those employed at Gatun, the mechanical details have

those employed at Uniun, the mechanical details have been varied to meet the local conditions. The latest report of the work, namely, that for De-cember last, shows that during the mouth the total work of excevation amounted to 2,818,862 cubic yards and that the total canal excavation of all kinds amounted to 2,811 681 cubic yards. The material

placed in dams, mainly at the Gatun dam amounted to 340,610 cubic yards, and dur-ing the month 57,285 cubic yards of conte worr built up in place

#### WALLEY'S COMET

Some interesting measures of Halley's comet, made with the micrometer of the Yerkes 40-inch refractor, are published by Prof Barnard in No 605 of the Astronomi cal Journal With this large telescope the comet was quite an easy object, and the measures should be good, but, as Prof Bar-nard suggests, the edges of such a nebulous

body are not easy to set on The measures extend up to Novemi 1909 when the estimated magnitude was about 110, and the comet showed a conden sation of some 7 inches diameter The diam sation of some 7 inting diameter. The diameter of the whole object was 41 inches, and possibly an ill-defined nucleus was seen, but this feature was very doubtful. From September 1. tember 17th to November 14th the mes

diameters reduced to miles ranged from 16,400 to 1 200 miles the mean being 12,800 miles, or about 11/2 times the carth's diameter

At the December 1909 meeting of the Royal Astro nomical Society reported in No 418 of the Observa formical Society reported in No. 418 of the Observa in: the Astronomer Royal amonutes that a photo-traph secured with the Reynolds refector at Helwan, on August 24th shows the comet's image, its position agrees within 0.12s in RA and 1.7 min in declination with the position calculated from the Cowell Crommelin orbit corrected by the Greenwich observa tions Mosars Keeling and Knox Shaw are to be cor gratulated heartily upon securing the first known phoconsupu of the comet. In No. 25 of the Gazette astronomique, Signor Pio Smannelli discusses the probable in countre between the series and the concet's tail in May next. At 10 A. M. (GMT) on May 18th the country lill pass the descending node of its orbit, while the earth will pass the same point circles on the country of the country of the country of the country of the same point circles on the country of the same point circles on the country of the same point circles on the same point circles on the country of the same point circles on the same point circles of the same point circles on the same point circle the earth will pass the same point eighteen hours later for an encounter between the tail and the earth to ror an encounter persons the tast and the earth to take place, it is shown to be necessary that the latter should be 22,100 000 kilometers (13,712,277 miles) long and that its breadth should be such that it extends, from its axis earthward, 400 000 kilometers (2 485,550

The accompanying that shows approximately the



The siniceways, etc., for rapidly emptying and filling the locks are of unusual size. WOODEN FORMS FOR GATUR LOCK COMPUTE

apparent path of the comet, according to Mr. Crommelin s ophomeris up to April 5th - Nature

# The Occluded Gases in Coal,

Prof S W Parr and Mr Perry Barker of the Uni cluded gases in coal, which is published in a builetin issued by the university. As a result of th work it seems that two active processes are set up immediately upon the liberation of the coal from mainly consisting of marsh gas (CH<sub>1</sub>), the second is an absorption of oxygen There can be little question, moreover, that the alterations proceed simultaneously There are present in the gause from all the samples of fresh drillings, notable quantities of methane, rang ing from 18 per cent to 86 per cent of the vario volumes. At the same time the oxygen present drops columns. At the same time the exygen present drops in a very positive manner, in some cases even reaching the vanishing point. That this transpiration of gases is interdependent and is of the nature of an osmotic exchange can hardly be affirmed as an explanation of



APPARENT PATH OF HALLEY'S COMET FROM JANUARY 6th TO

the phenomenon. On the contrary, there seems to be evidence that the gases operate independently of each other

the three case of samples of marsh gas the exudation of CH, seems to have spent itself in those samples held in laboratory containers for two years. In no case is there evidence of further liberation of this gas, agen with thorough application of the vacuum An evicuation of the gases from two-pear-old samples above so many agents. The completion of this exudation would seem to be reached after two months, though it is well to note that by forcing, as with a vacuum, the two-months-old sample may be made to yield more methane, though in relatively small quan-tities. On the other hand, the avidity of the coal for exygen seems to be pronounced at the very beginning of the exposure of the freshly-mined material, and while there are a number of cases where a certain agree-ment seems to exist between the in-going and the outgoing marsh gas, still there are more cases where the tion of oxygen is pronounced without any evidence of marsh gas being present. In all cases the nitrogen ratio shows a positive diminution of the oxygen from the normal ratio of approximately present it seems fair to conclude, for the present

that there is no necessary connec-tion, at least of a strictly chemical nature, between the exudation of marsh gas and the absorption of

oxygen

Again, the liberation of CH,
while very active in the first few
days after removal of the coal from
the ground, diminishes in amount
quite rapidly till, after the second month, there is very little of this gas in evidence. The activity of the coal for exygen, on the con-trary, seems to be of longer dura-tion. Samples collected June 1st, 1906 were tested in May and June There is marked abo orption of oxygen in the sample after two days' exposure in the flask to nor mal air, while in a second, with five days' exposure, a still fu reduction in the oxygen ratio with-out accompanying evidence, also, it should be noted, of marsh gas, was obtained A marked avidity for oxygen was shown after two years

oxygen was shown after two years from the time of collecting These facts have a direct bearing on the topic of deterioration as sub-stantially defining the limit as to time of that form of alteration

While varying semewhat in different coals, the loss of hydrocarbons for the most part is practically complete at the end of two months. These facts have a bearing also upon the matter of weathering, and indirectly upon the matter of spontaneous combustion. The absorption of oxygen is undoubtedly closely associated with both of these phenomens. The studies upon the weathering processes coincids with these studies in gases, namely, that in all probability this low type of oxidation extends over an indefinite length of time Moreover, while under normal conditions there is ef cted but a very slight exidation and less of fu values, the conditions are favorable, as, for example, for bringing about a very rapid combination with oxy gen upon an increase of temperature

gen upon an increase of temperature
How far this absorption of oxygen is a chemical
reaction, or low combustion resulting in CO, and H,O,
and how far an absorption into the molecular structure and composition of coal must be left for study

#### Dying Pearls

In the Museum of the Louvre in Paris lies a collar of pearls at the point of death. Its death-bed is a plaque of velvet, and it is the large collar that was part of the personal estate of Thiers and once belonged to his wife. It is simply set and has no artistic value, its is simply set and has no artistic vatue, its material value, however is estimated at 480,000 It consists of 145 pearls in three rows, the total weight of which is 3,007 grains, the three largest pearls of the col lar weighing 34, 39, and 51 grains respec-tively. This collar must "die", every day it loses another degree of its luster, and in the course of the present decade it will be-come as the present decade it will become as dingy as a much-worn wreath of

> Why? Because pearls keep their incomparable sheen only when worn by women and come into habitual contact with the

and come into habitual contact with the sentle, soft, and warm skin of the wearer Whee, for instance, Queen Augusta died it was found that her magnifecent strings of parts were likewise in a persistent decline, parts were likewise in a persistent decline, and for the reason, indeed, that for many years and for the reason indeed, that for many years and for the men them on her learn book (which fact was explained by her says but only around the fact was explained by her says but only around the fairly of the men of the fact in sew-water was prescribed for them out of battle in sew-water was prescribed for them ment or cann in secwater was prescribed for corons by experts, and for several months, under obvious necessary precautions, they were sunk into the sea and thus recovered their old luster When, for instance, a collar of pearls is taken from

the neck, where, subject to a temperature of 40 deg C. approximately it has lain for hours, and is laid upon the marble plate of the dresser, which is perhaps only 20 deg. C warm, it feels, so to spe (Concluded as page 172.)

## Correspondence.

#### MR. RIEDERER'S PROBLEM.

# or of the Burntune Americ.

Your correspondent who replies to my problem cer tainly has not studied the question There is absolutely no doubt as to the possibility of the solution for taking any single number, it is quite evident that the remaining 14 numbers will make 7 pairs, each one of which with the taken numparty, McLi one or which with one it kinds number between the different combination of three What wise. So that certainly proves that 7 combinations as told are passible The question is, how can the or any other spinites requirements to the contract of t

CHARGE ATIONS OF A METEOR IN FLIGHT
To the Middle of the Schemitto American
I have eign no mention in the newspaper of the
meteor that fell west of Corrington, North Dakota, on January 18th. It was seen for seventy miles south of Streeter, North Dakota and passed over us with great speed. It buried itself six feet in the ground about seventy miles north of Streeter The heat pro-duced was so great that for forty-eight hours no one quesa was so great that for forty-right numb no one could approach it closely notwithstanding the fact that the ground was covered with snow and was fromen to a depth of four feet. When the meteor passed over our heads from a southwesterly direction to northeast, it shone most brilliantly The no very large cannon ball in flight. The diameter of the or is 56 inches. It has been taken out and sent to Blumarck Streeter, N D

## SOME STRANGE ANIMAL INSTINCTS.

#### To the Editor of the Scientific AMERICAN

Two items in your science column of January 8th, 1910, interest me That about the return home of the kitten and cat because there are scientists in your own city and elsewhere who have held doggedly that own city and essewance was nave need suggestly that the special sense of this conderful ability to go back home is not a special sense but the result of some sort of observation, although the set may be blind folded. They even claim that homing pigeons find folded. They even thim that homing pigeons and their way back by observing the lie of the country. While this instinct is by no means uncrring, and is developed to a much greater extent in some individuals than in others, there seems no justification of the denial to these lower creatures of a faculty of orien tation or traversing which man possesses in only a small degree. There are many instances where the return has been made over a route very different from that of the outgoing journey and could not have been infinenced by the topography, even if it could have been observed

The other instance is that of the magpie which was fond of rubbing tobacco and its ashes into its plu as mentioned by the writer in Kosmos. This is of special interest to me because I had made a similar observation on a blue my—a relative of the magpio-and had never so far been able to confirm it from any other source Fortunstely as long ago as 1895 I recorded it in my little book "The Story of the Birds" (Appleton) from which I venture to quote

"I saw him (the jay) engaged in the walnut tree one day in late summer in a manner that made me fear that his bath had not been sufficiently effectual He would pluck off a leaf, lift his wing and rub it into 

strikingly odorous, for the sake of the portune only in which they seem to delight, but these two are the only instances that I know of where birds are re-corded as doing the same. It would be interesting to bear from any other instances—if there are any, as JAMES NEWTON BASKETT is likely

#### RE-ARMING OUR WARRING To the Editor of the SCIENTIFIC AMERICAN

In a letter to the SCIENTIFIC AMERICAN of Septem 5th, 1908, a correspondent, Mr A. B Wingfield, suggested the rearming of our "Connecticut" class of battieships with four 12-inch guns in place of the eight 8-inch that are now carried in the main battery of this Finch that are now carries in the main natury or that type. The Editor's comment at the time was that the greater weight of 12-inch gun emplacements on the beam would necessitate too costly structural strongth enings to justify the change, that the 4-inch armor protection would be too light for these emplas ments,

and that the increase in dead weight would sink the already low armor belt even lower in the water. A previous letter appeared in your issue of August 18th, 1908, and since then changes of this character have been under consideration

I know that if the SCIENTIFIC AMERICAN takes up this matter, its influence will be brought to bear on naval men, the object in view, of course, being to navai men, the object in view, of course, being to make dreadnoughts of the "Conorcitent' type and semi-dreadnoughts of the 'Georgia' class. The younger officers in the navy whom I have questioned in regard to this matter are unanimously in favor of these in

As armed at pres ent, the "Connecticut' and "Geor ia' classes are not as efficient as a comparatively nail additional expense could make them, and in small additional expense count make tneur, and in view of the conneeded superiority of the all big gun type of ablp, if seems worth while to consider how it would be possible to so reconstruct the above types as to make them more formidable against dreadmoughts.

The pre-eminent function of a battleship is to concentrate the greatest efficiency and power possible in a single vessel The armament of the "Connecticut" class consists of four 12-inch eight 8 inch, 12 7-inch, and twenty 3 inch, of which four 12's, four 8's, six 7's and eight 3 s can fire on broadside. The "Georg type mounts four 12 inch, eight 8-inch, twelve 6-in The "Georgia" and twelve 3 inch, of which four 12's six 8's, six 6 s, and six 3's fire on broadside Now to convert these ships to dreadnoughts it would be necessary to mount one 12 inch gun in place of the two 8 s in each of the beam turruts keening the employements as they are

As the 7 inch guns are too small for battle ranges and too slow for torpido defense they could be suband too slow for torpido derense they considered by the 5-inch rapid fires which are now being stituted by the 5-inch rapid fires which are now being treadnoughts. With say eighteen of these and a few more 3 pounders in place of the present twenty 3 inch gans, the change is complete and you have a vesse! the equal of the "Michi-gan' type which are really powerful dreadnoughts on

"Connecticut' displacement
In the "Georgia' class the same renovatio in the "Georgia class in same reconstitute would be made, extrept that the four superposed %s would have to be retained and the six additional fee omitted The 'Idaho' and 'Mississippi' could be similarly treated Under this arrangement the armanent of the two classes would now be "Connecticut" eight 12 link and eighteen 5-juch with a broadside fire of six 12 s and nine 5's "Georgia" six 12 inch, four 8 inch, and twelve 5-inch with a broadside fire of five 12 s, four 8's, and six 5's. Then our two 'Idahos, four 'Georgias," six "Connecticuts" two 'Michigans" and two "Delawares' would mount 124 12 inch guns in stead of 84 as at present, and would practically be a The benefits from these changes dreadnought floot are as follows

- A homogeneous broadside giving greater con centration of fire at battle ranges
- 2 A simpler system of spotting and fire control, with only one range to get and only one caliber of gun (excepting the four 'Georgias') in the main bat
- A greater efficiency of ordnance resulting from ore uniformity in ammunition and con-
- in handling A better organization for and the quicker deliv ery of shell
- An opportunity offered to hold former 7 inch gun crews in r serve for turret crews The c immation of unwieldy and inaccurate mid dle batteries with largo crews necessary to their serv
- ire in exposed positions
  7 A smaller number of mon in action at the time and behind heavier armor (Le, turrets only) at
- battle ranges
  8 An increase in the efficiency of torpedo defense by a gun more practicable in every way than the old caliber, which was ineffective at 3 500 yards and re-
- or, which was memorative at 3 hou yards and red d the same number of men to handle it. The lightening of the armor belt and bringing gher out of the water, where it belongs. The placing of the entire main battery behind

Now as to the cost For one battleship of the "Con necticut" class to be improved as shown above, the ex pense would consist chiefly of the price of four 12 inch and eighteen 5-inch rifles, and the remodeling of the and eighteen 8-inch rines, and the remodeling of the Sinch turrets and handling rooms The 5-inch guns could occupy positions behind the old 7 inch barbettes, on the gun deck the 3 inch casements (slightly on larmed) on the main deck and new mounts for the I do not believe that the structural part of the ship would need strengthening in any way Moreover, all these discarded sights, sevens, sixes, and threes could be mounted on smaller cruisers, where they could do the work required of them, and thus

noney on new construction could be saved

I think that you will agree with me in saying that
fifth these improvements made our pre-dreadnesight type will not only possess far greater efficiency than

in the first line of battle with future dreadnoughts The real question is this is this greater efficiency worth its cost? In view of the slight difference in worth its court in view of the siight emercuser in the cost of maintaining in commission a "Connecti-cut" and a "Delaware," I think it is and the Sciv-Tific American can do a lot toward making these paper changes realities. Brooklyn, N Y HAROLD M. KENNARD

|In publishing this interesting study of mosted question, we would point out that it seems to be the unanimous opinion of naval men in all navies that the rearming of the older ships does not pay, that in rearming of in our sups over not use, that all appropriations for construction should be put into new ships. Such changes as are suggested above would involve enormously costly structural work on the hulls. There is no room for 12 inch guns in the 8 Inch turrets -En ]

#### The New Supplement Cutalog

The publishers of the Scientific American have issued a new catalogue of the Scientific American Supplement in which 20,000 articles are listed Many of these articles have been translated from foreign or mess arricles have been translated from foreign publications which are ordinarily inaccessible to Eng-lish-speaking readers. Many of them also are papers read before the learned scientific societies of the world and accessible only in a few large public libraries. The articles are all carofully indexed so that the best information on any particular scientific subject may be found in a few minutes. The catalogue will be sent gratuitously to all who apply for it

#### The ( present finance

The current Rulliamyr, No 17st contains some remarkable pictures of the Seven Wonders of the World, together with a good article on them "The Practical Utilization of Insect Parasites" is the title of an article which will interest the farmer. Another installment of the Murros and Hall paper on "Occabustion and Explosion, a Primer on Explosives for Coal Miners' is published Some how uses of paper are described for D. A. Arthur contributes an article Color of the Coal Miners' and the Coal Miners' are supported to the Coal Miners' and the Coal Miners' are supported to the coal many that the common cut what colorised their new year, this strike comes cut what internal-coulosides pump is concluded. Leoured da Vinci, perhaps the only truly all-around genius of the world, is the supple of an excellent article by Ether of an article which will interest the farmer world, is the subject of an excellent article by Edward P Buffet The Wright injunction is summarised and llingirated

#### Comete Due to Beturn This Year.

in addition to Halleys, two other comets are due to pass through perihelion this year. The first is known as Tempel's second periodical comet, discovered in 1873 July 3rd at Milan Its period is about 51/4 years, and it was re-observed in 1878, 1894, 1899, and 1904, making its perihelion passage, on the last occa-sion, in November, it should therefore return this coming spring D'Arrest's comet, discovered in 1851, is the second object, and is due to return during the summer of this year Its period is about 6% years and it was re-observed at its return in 1857, 1870, 1877, 1890 and 1897 but it escaped observation, being un favorably placed, in 1903

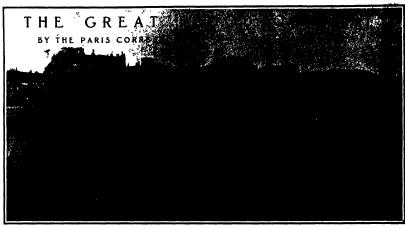
Mr Lynn, who gives those particulars in No 418 of the Observatory also recalls some of the historic oc-currences which have coincided with the returns of Halley s comet.

## The seientific American Fourth Dimension Book

The renders of the Scientific American have hardly forgotten the SCHNTIFK AMERICAN'S Prize Competition for the best simple explanation of the Fourth Dimen sion The prize of \$500 was awarded to Licut Col Graham Denby Fitch, USA His cassy was published in the SCHATIFE AMERICAN for July 4th. 1909 and o others which were accorded honorable mention Ly the judges followed in successive issues

It seemed to the judges that of the 245 ossays sub mitted, a certain number showed more than passing nulted, a certain number showed more than bassing merit Inasmuch as the popular liberature on the sub-jot is by no means extensive, the publishers decided to intrust to Prof Henry P Manning of Brown University, one of the judges the took of a lexiting some of the best contributions. This Prof Manning has done. These seasys ingesther with the cassays which were awarded the prize and homorable mention, are now published in a book which has just been insued by Muna & O. publishers of the Kerverira Aussicas. An elaborate introduction is provided by Prof ning in which he critically and yet simply discuss fourth-dimensional geometry and gives an excellent hibliography on the subject The book sells for \$150 and can be ordered through any newsdealer or book seller

The deepest coal seams mined in America lie ab a depth of 2 200 feet some of the coal mines in Eng-land are developing seams at a depth of 3 600 feet while coal mining is carried on at a depth of about



The Seine near the mint.

The inundation of Paris made many of the streets of that metropolis as navigable as the canals of Venice that metropolis as navigable as the canals of Venice The highest point reached by the water was 31 feet 4 inches above the normal at the Pont Royal Not since the historic flood of 1615 has Paris been visited by such an inundation On January 29th the waters began to fall, and the city for the first time began to feel safe Even as it was, the Seine was swellen to to the sea twenty times faster than usual. The banks have been overflowed for from haif a mile to a mile on either side. That vast and wonderful sewer system which figures so dramatically in Victor Hugo's 'Les Miscrables and which has been dwelt upon time and time again in every guide book of Paris, and that intricate system of subways which handles the vast traffic of Paris, have both played their part in this catastrophe. They served as conduits for the flood liuge as they are, they were unable to cope with the turbulent waters. Pavements were pressed upward, and the water bubbled up into the streets. Apprehen and the water pushed up into the airwest. Apprehen-sion was foil for the safely of the monuments of the French capital, an apprehension which is not yet stilled it seemed almost certain that their founda-tions would be sapped. It speaks well for the work of French engineers that none of the twenty four bridges that span the Seine was carried away, and that it was found necessary to close but eight of them On the cther hand, these bridges undoubtedly helped to dam the waters and to aid in the citys inundation. It speaks well for the architects and masons of the middle ages that the famous Cathedral of Notre Dame

uld have stood in a lake for days and days without snoun have stood in a lake for days and days without suffering injury Many of the historic buildings of Paris were flooded, but fortunately the art freasures seem all to have been preserved with little or no figury When the saturated ground dries out and contracts, it may be that some of the buildings will settle and possibly collapse. The Louvre, although flooded, was still able to serve its function of housing its pricewas still able to serve its function of bousing its priva-less pinkings and its statuse. The great shops could not be opened on account of the water. The fances liberty Francis still gave its performances, but it used candles as it did back in the days of Mollare It was but satural that the Chamber of Deputies should have continued its seasons and exhibition of right on the part of the legislators would undoubtedly have heightened the public terror. As it was, the numbers were ferried arross the equars to the cham-

hemores were lettric across to a square to the trans-ber. The old Latin Querter and the Champ de Mars, the Rue Royale, the Houlevard Haussmann, the Place do la Concorde, the Champs Elyssés were swamped Naturally the authways suffered heavily. Only the Gare du Nord seems to have escaped. The station of

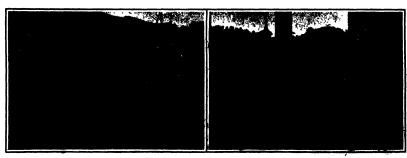
St. Lazaro seems to have suffered most severely As it was, the suburban traffic was entirely cut off, so that it was, the suburcan trame was entirely cut of, so that the sparing of the (eare du Nord served simply to give the frightened populare a place of questionable rofuge Fortunately the waters rose so gradually that the lulubitants of the sewers (the theme of many a the numbitants of the severs (the teems of many a thrilling French short story) and of the basements and sub-cellars of Paris were able to escape. Buburban towns lying somewhat lower than the city have suffered. The breaking of a dyke completely inundated Gennevilliers. Its community of 10,000 pers

demonstration. In community of 19,000 persons and driven out by ten feet of water. Paris may now be considered safe from water, but the danger from sickness still prevails. The stench of the stagnant water and of the drowned animals will undoubtedly continue for days. The Paris health orities will find difficulty in coping with that situation

The actual cause of the food has not been tally revealed Some explain It secondarily by arruing that the basin of the Science had become acturated during a mild winter, characterised by heavy rains and little caporation. It will be safer before accepting this theory to avait the investigation of the municipal engineers. Only when the floods have subsided and accredit examination can be made, will the full measure of the diseaser be assertained. The accounts of burst-ing severs and sulways and caving streets point me several and sulways and caving streets point in several contents of burst-ing several and sulways and caving streets point the famed Parisian sever and sulvay systems. It is probably be nomitae before Paris will conduct business as it did before the flood.

The antipering aspects of the flood have been self-

The engineering aspects of the flood have been suf-ficiently discussed in our editorial of February 5th. For that reason the results of this Parisian inundation acced not here be dwelt upon again It is clear that anot not here be dwelt upon again it is clear that either the channel of the Selien must be widened by dredging, by the removal of river plers, or by the inordinately expensive construction of an artificial waterway around the city, a waterway which will serve the purpose of diverting the surplus of the Selien in time of food and of discharging it below the city.



The goodeliers of Paris.

A cart-terry in one of the size

- Recisionation of the Principlus Page Stock.

This total area of the past loop and morrs of Germany is more than 3,000 square miles, of which about two-fittle are situated in Hanneyr and Schleswig-Holsidat. The Pression government possesse in East-Priesland marty 4,0000 acres of upland morrs, of which about 10,000 acres, known as the Agrick. Or "Pricebology loop, have for roller parts boat the boom of the page on with great skill and energy, though unfortunate tunately on wins great sain and onergy, though uncorumnately with a degree of secrecy which makes it difficult to assertable the exact facts, sithough the undertaking is of the greatest and most general importance. It is consistent and the control of the

Il supply electric cur-nt he light and power the matter of thirty let. Electric light, thus of, is already supnod several other es and towns, and large titles of ammonia, hygen sulphide, and other cour products are sold in various indusclaimed lies between the ns-Jahde canal on the north and the Nordgeorga-fehn cabal on the south, between which a connecting canal will be con structed. Short canals will connect the system with the canals of the older moor colonies to the westward. In all, 38 mile new canals will be re-quired Their construc-tion will necessitate the stripping of about 850 acres of moor, from which it is estimated that nearly 350 million cubic feet of peat will be obtained Tf this work were done by ds would not be fin-

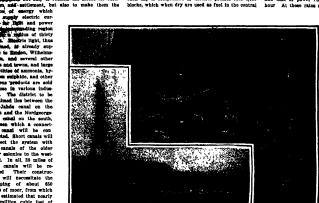
iabed in several decades, during which period the price assed in several occases, during which period the price of peat, already very low in this district, would con-tinus to ducline Both of these difficulties were avoided simultaneously by the adoption of electrical methods, by which the work of excavation is carried on very rapidly and supplies its own fuel In the center of the moor is a boiler plant, which consumes peak ter or in moor is a solier plant, which consumes peak acclusively. The problem of course, will be still more simplified when a method of producing electricity directly from heat is developed.

The first settlers established on the Friedoburg moor

The first setters established on the Friedoung moor will carry on what is known as surface cultivation, and will at the same time gather peat, which they will sell to the electrical company, the charter of which runs for seventy five years. As the high moor is thus the r ethod of cultivation will be gra changed to that which is employed in the low-lying of Holland

All of the energy is supplied from the central power station of the Siemens-Schuckert Company, situated

on an island in the bog at the intersection of two main roads. From this point wires, supported by poles, radiate in all directions, supplying light and wer to the whole country for many miles The main canal is bordered by several rows of po and wires, one for the telephone, another for the postdigging and agricultural machinery, a third for the high-tension alternating-current long-distance service supplied to the surrounding cities in November of this year. The station is equipped with two steam turbines of 1,800 horse power each. The great plows used for the excavation of the tanais have iong been driven by electricity. The peat dag each day is compressed by electric process into 4,000. blocks, which when dry are used as fuel in the central



Scenes from the great Paris flood.

station In the gas at perators 40,000 cubic feet of fuel gas and 30 pounds of ammonium sulphate are obtained from 100 pounds of peat. The combustion of this quantity of fuel gas gonerates 273 horse power hours of energy, while the sale of the ammonia compounds ood interest on the capital invested tracts for supplying light and power to most of the surrounding towns and cities have already been signed. The duration of the contract in most cases is forty years, while the charter of the Siemens Schuck ert Company will remain in force seventy five years
The area assigned for cultivation and mettlement com prises about 17 000 acres. The digring of the canal requires the peat to be removed from a strip about 150 feet wide, so that the construction of the 38 miles nal will involve the stripping of 650 acres average depth of the peat is 11½ feet. Deducting the superficial stratum of 30 inches, which is compara-tively worthless, the digging of all the canals will produce about 247 million cubic feet of peat, which

when dried will furnish 1 1/3 million tons of fuel peat. This amount of fuel alone would supply the central station, producing five million kilowait hours of en sixty-six years On each side of each car a strip 165 feet wide is to be cleared of peat for cultivation and settlement The peat thus obtained, added to that obtained from the canals, would enable the capacity of the station for the duration of its charter be tripled

An idea of the cost of the electric light and power thus furnished may be gained from the contract re-coulty concluded with the town of Baut, in which the price of lighting current is fixed at about 10 tents and that of power current at 5 cents, per kilowatt hour At these rates a 16-candle carbon incandescent

lamp or a 40-candle metal samp or a 40-candie metal Blament lamp would cost about 1, cent per hour and an arc lamp from 2 to 6½ cents per hour ac-cording to its candle power Thus the Friede burg bogs are to be util-ised as a field for colonisation, as a source of Hight for the surrounding coun try within a radius of 30 miles, and as a cheap and reliable source of power for all the cities and farms of Ea though all the hopes which have been built on the en terprise may not be ful filled, it is already certain that the reclamation and cultivation of bog land has entered upon a new and promising stage of de-velopment in consequence of this application of electricity It must be admit Friedeburg moor the con ditions for reclamation are especially favorable The land is in general level, and it has already superficially and smoothed by burning The roads through the moor are already bordered

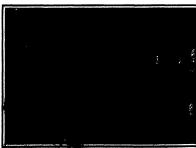
with rankly-growing grass

Peary a Bear Admiral.

Commander Robert E Peary has been made a roar admiral of the highest grade and with maximum pay. so far as the Senate can accomplish such recognition of his services The bill recently introduce ator Hale was favorably reported from the Committee on Naval Affairs and promptly passed without dis

The bill authorizes the President to appoint Comr Peary a rear admiral with an extra number and places him on the retired list. An amendment was adopted giving him the pay of a rear admiral of the first grade

The top notch pay of a rear admiral is \$8,000 a year and that of the same officer on the retired list three fourths of his active compensation. Thus Admiral Peary will receive \$6,000 a year for the remaindur of his life







The submerged Rue de Lyon.

# Industrial Chimneys and Water Towers of Concrete Blocks

BY H. PRIME KIEFFER

The employment of concrete blocks for the construc-tion of factory or industrial chimners and water tow ers is one of the most mainril use of that new form of building manufal. It is very surprising that the iden of willists, separately molded blocks for this per pose should have come from Europe instead of Amer ica where blocks have found a wider range of use than in an country in the world. The system is the ideal one for the rapid exection of factory chimneys. In the United States there have been in use some twenty different systems in which armored concrete is employed but they all have some primary form of is implicit that they all have some primary form a saffolding in their designs. This is the underlying reason sky those thinneys cannot be constructed more commissing and rapidly. The method of constructing thinness of separate is mobiled constructing thinness of separate is mobiled constrainting the invention of M. Duman, an engineer and architect of I mass is Biglium. It has controlled by Lon Monneyer of Pils also of truescle who furnished the data and photographs for the present article. The system is notable for its simplicity its beauty of form its econ omy in cost, and its adaptability to rapid constru

The chimness are like all others in that they are ed of three pasts the foundation the base and the shaft

of a special design. The in the accompanying dia gram. The number of blocks in each course at ways remains the same, yet there is a taper to the chimney They are placed in regular horizontal courses to the required height and upon the top is placed a special capping block of either concrets cast from or cut stone The builders work on

a rough platform and from the interior of the stru ture and each block is re coived by them ready for its particular position Two men are usually em ployed above in laying the blocks, and two below to blocks, and two below to hoist them to the platform. The blocks in each suc-ceeding course are placed in the opposite direction, that is to say, all the even courses will have the same direction and all the odd courses will take the rener, the joining of the blocks of one course where they do not meet perfectly will be covered by the blocks in the course by the blocks in the course showe As shown in the diagram each block has at one of its extremi ites, a 'hook' similar to the shape of the letter 'U'' This "hook" forms a hollow space which ex-tends the full length of the chimney and of course there will be just as many then are sides to the chimner Through these vertical hollow spaces are placed vertical from rods B, varying in diameter as cording to the height of the structure At each

course these rods are fied or bound to the courses by U-shaped flat from yokes These in turn, are wired to a small iron ros D which is placed between the courses horizontally and in a groov made for it in the top of the blocks

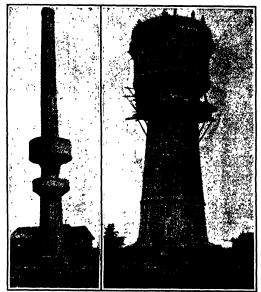
The placing of the vertical rods in the openings and not in the substance of the shaft proper forms an important advantage of this system. The rein forcement is thus kept at a low temperature, and is not subject to the injurious effects which would arise nor an open to in injurious errors which would arise from unequal expansion if the steel was in the center of the mass. Ferror operate is indestructible by fire as long as the temperature of decomposition of courete is not reached but it must be remembered. that although the co-flict of expansion of cement are the same, the co-efficients of conductibility are very different, and fracture is likely to arise if, from this cause, the temperature of the iron exceeds that of the concrete Consideration of this condition is espe-cially important in the case of a structure which is heated on one side only, such as a chimney

A clever idea in connection with the design of the blocks is that there is need for only three, or at the most, four sizes of blocks for the average chimney



- The vertical steel orderioring rod The concrete of the ideal.
  The reinforcing red commerting all the blocks in any one courses.
  A flat U-shaped iron trace which holds the vertical rod at a fixed position to the helbow space.
  Mortar Silling

Cross section of a portion of a concrete water tower Section at one end of the joining of two of the courses.



Concrete block chimney carrying two

k water tower for the 1910 International Exposition at Brunels, Belgium,

#### INDUSTRIAL CHIMNEYS AND WATER TOWERS OF CONCRETE BLOCKS

150 feet high and with a taper of one to three percent. This is made possible by the following arrangement. The mode by which the blocks are made one sist of but three cast-iron places, hold together by wooden stop blocks, and three ordinary iron clamps of the control of the 150 feet high and with a taper of one to three per

each succeeding course has a diameter smaller than the one below it, and in this manner, the taper of the chimney is obtained. As the longest bleds are some three feet in length and the distance across the seral circular opening about six to eight inches, it is possicircular opening about act to sight inches, it is possible to make a condérable taper in this manner. For a taper of 1½ to 2 per cent, the sin-wife the blocks in changed every forty or fifty feet. This blocks may, of course, be laid with absolutely no isper, and then one size, only, of thebeas is also some size, only, of thebeas is used Some shitmaps have been constructed on this plan, but their appearance in not so generate as these having a slight super. The concrete blocks are usually making at the about the concrete block factory, and this may be ignomested in case there are several chimneys under construction in the same direct. The proportions for the concrete

case there are several climners under construction in the same district. The proportions for the conserved mixture vary somewhat, but the usual saixture consists of about five parts gravel, three of sand, and two of cament Dust of stone is used sometimes, and has given very good results. From an archimetural point the chimneys constr seent a pleasing appearance Being thinner than ck chimneys, they rise more gracefully from their ses, and yet the strength and stability which they irick chim

attually possess is at once suggested to the eye by the appearance of strength which is presented by the protruding rounded angles. A number of chimneys

A number of chimneys and water towers have been built in Europe after this system, and the two photographs presented in connection with this arti connection with this arti-cle show a water tower, and a combined water tower and chimney. The water tower which is lo-cuted in Uccle, a suburb of Brussels Helgtum, will be used in connection with the 1910 exposition to be held in that city tower and tank have a height of 145 feet and th height of 145 feet and the latter has a capacity of 280,000 gallons The struc-ture is circular and is built entirely of concrete blocks and without mold ing of any kind excepting that used in the building of the concrete reinforcing struts surrounding the base of the tank proper The inside of the tank is built up in practically six stories connected by a winding stairway These different floors are divided into rooms which will all be occupied by anginoers. foremen and other work men during the exposition The stateways are placed long the outer walls an the water remains in the center inclosed by a con crete covering of square

# Oil That Cold Will Not Affect.

It is often difficult to keep machinery properly oiled in cold weather, as the oil freezes in the oil holes and the cups, and the oil upon the ways, of the

lathe and planer becomes stiff, causing the machines to work hard. A good oil for winter use is made by to work hard. A good oil for wither tise is made by mixing graphito with cylinder oil until in a thick or jesty consistency, and then adding kerosene until it flows freely. This oil will not become stiff at 14 degrees below sero, and it valuable to those operating machinery outside or in cold shops.—Power

In his presidential address to the American Street and Intervitum Railway Association, Mr. Shaw, at Donver, said that in round numbers there are 1,350 street and intervibus railway companies in America, with a total of 3500 millies of single-track and finite with a total of 3500 millies of single-track and finite present the property curried annually in 1,000,000, and the gross income \$44,000,000. ----



#### THE CONSTRUCTION OF AN IMPROVED SILICON DETROTOR BY OR

The detector described here is one that can easily The detector described new is one that can easily take the hame 'improved,' being a radical departure from the coarsely-adjusted detectors generally used if properly constructed and connected, it will easily pick up wireless messages sunt from very distant points. The component parts are shown in Fig. 1

The base of the instrument is fashioned from hard The base of the instrument is rasmoned from hard rubber, 3 x 2 x ½ inches, ½ inch holes are bored in it one inch from either end A support for the crystal cup is made from annealed brass, 4 inches in length %, inch in width, and 3/16 inch in thicke bent to an L shape, as can be seen in Fig 2

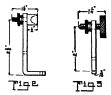
The crystal cup is turned from brass rod 1/2 inch in diameter It is threaded, as soon in Figs 1 and 2, to fit a thumb nut. The crystal is fastened in the cup by means of lead. This insures a good contact. The ad-



Tiq. 1

#### SECTIONAL VIEW OF THE ASSESSMENT DETECTOR

mechanism can be made to move a steel half spiral, the point of which makes contact on the silicon to the thousandth part of an inch. The phospho-bronze strip upon which the spiral contact is fastened is 3 inches in length, 1/2 inch in width, of No 28 B & S gage sheet It is boiled to a cube of brass which in gage sheet it is boiled to a cube of brank which in turn is fastened by means of a machine screw to the base. This wrew serves also as a binding post. The brass post supporting the adjusting screw is of 3/16 inch brass of the same stock as the L-shaped post. It is 214 inches in length, % inch in width, and 3/16 inch in thickness. A 1/4-inch hole is bored 1/4 inch from



SUPPORTS FOR THE CRYSTAL AND THE ADJUSTING

one end to admit the machine screw that binds it to the brass cube Another hole is bored 1/2 inch from the other end and tapped to fit the adjusting acrew. The adjusting acrew has a large knurfed rubber handle for adjusting purposes, also a lock nut to be tightened when the detector is at its most sensitive point

This detector is comparatively easy to construct and is lnexpensive. The one undesirable quality in silicon detectors—their ability to get out of adjustment—is almost entirely eliminated in this detector, due to the use of the spiral instead of the solid contac

#### INCREASING THE EPPICIENCY OF WIMESURED REBOTRIO MACHINES. BT GRONGS / BURDOUR

The Wimshurst static electric machine, as is well known, consists of two glass: (recles revolving on a com-pound axis in opopsite directions. As nauslly made, this machine is inferior to the Tospler-Holtz type, al though somewhat cheaper to make, and superior in simplicity The latter quality has been without doubt ever the small electric discharge this machine will

give as commonly made, will answer the purpose.

In building both kinds of these interesting chines it is the practice to varnish the revolving g circles with white shellac dissolved in alcohol higher grade machines the best quality of shellar and grain sleehol are used for this varnish buffer the toy arlety wood alcohol and the cheapest grades of shells d Some years ago the writer was building both Wimshurst and Toepler Holtz statics, but was un able to obtain a discharge from the Wimshurst type that could compare with the other kind, even wh

that could compare with the other kind, even when the glass tricks were of the same diameter. The development of the machines in both tases had extended over a series of years, and it was supposed the limit was reached. At this time the Toepler Holtz were giving with 26 inch circle (using the Leyden jars) equal to the radius of the circles or 13 inches long thick as the thumb and when discharging detonating like the sound of a rife

The Wimshurst machines with an equally large (in uld not give sparks over 4 inch long, and as thick as a knitting needle. Finally, in building a lot of six machines it was found some were much bet ter than others. Hirenuous efforts were made to asserat caused the increase in officiency but v discovering anything different in the construction of those that showed the improvement from the others in the next lot after this, however, all of the machines aere capable of giving sparks 6 inches long, although the diameter of the glass circles was but 14 inches The thickness of the spark had also increased to the size of a pipe stem and this wonderful increase of efficiency was attributed to some quality inherent in s of which the circles were made made of the manufacturers of the glass fatled to disany different methods of making the glass than

had been followed for many years

About this time the writer in varnishing some circles held one of them up to the light and was struck by its light green appearance and although giving it little attention at the time gained the impression that this change in color might have something to do with the increased efficiency still unaccounted for after this a new lot of machines were built and every one of them had reverted to first principles so far as the spark was concurred it being short weak, and spindling. In the effort to find out what had caused the reversion the writer called to mind that just be varnishing the last lot a new brush had b in a new batch of varnish

is customary in making the varnish to dissolve the shellac gum in a glass jar with a mouth just large mough to get the brush in conveniently and the brush is left in the jar between the construction of the differ ent lots of muchines. It was found that the old brush had been shedding its bris ties, and to prevent this had been bound around with some fine copper wire The action of the varnish had been to corrode the cop per and the sait had given the varnish the faint green color noticed some time before on the gimes cir cles, although there had been nothing different in the

color of the body of varnish in the jar apparent The suspicion dawned on the mind of the writer that this had been the cause of the increase of efficiency and the lack of it in the last lot of machines batch of varnish was accordingly made, and in it was put about a quarter of a pound of fine bare copper wire. A new brush was procured and placed in the jar and the varnish allowed to stand in a warm dark room about a week, when it had assumed a light green sed to coat the circles of a new ma

This machine was found on trial to be even more efficient than the best of the others

In experimenting with the newly discovered varnish it was found that if it was allowed to become a dark green the voltage of the machine was interfered with and while the spark would be thicker it would not jump as far. The best results were obtained when the rolor was a very light green. The reason for the in creased efficiency was thought to be due to a decrease of the relistance of the shellar between the sectors on which the equalizing brushes bear

This varnish was tried on Toepler-Holtz machines without their showing any marked in rease perhaps due to their being air ady capable of delivering sparks equal to the radius of the glass circles

The use of varnish made in this way will be found

by amateurs and others to add greatly to the capabili-ties of the Wimshurst ma hine, and besides the light green color on the glass adds to the beauty of the in-

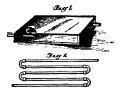
Many builders of Wimshurst machines as well as those experimentally inclined have trouble in making the brass sectors stick to the shellar. As tinfoil soon wears through from contact with the equaliser brush wears through river counter with the better grades of machines to secure durability. Brass sectors can be made to sirck permanently in the following manner in varnishing the divide about three conts is governally applied with a large flat camel's hair brush

Each coat is allowed to become moderately hard be-fore applying the next. After the last coat is ap-plied, and has stood about fifteen minutes mark the ons where the sectors are to go (they sho evenly spaced), and after applying some varnish to the evenly spaced), and after applying some various to the under side of the sector, press it down into the soft variable until a slight ring swells up around the margin of the sector. After the varieth is hard an examination will show the sector devetaled him the variable from the sector devetaled him the variable. from which it will never separate as it will if comented in any other way on account of the expansion and con ns of the brass being so much greater than the glass, and causing the sector to become le

## SILVERING GLASS AT HOME.

#### ---

A good glass inferor mids with on a own hands is a filting to be proud of Wirrors are now selfoun made by the Hinfoll and meturn process because of the drag-ross sharater of the work but pure silver be drag-ross to the sole and bread The silver provess in soil in the least dangeross to the workman. The formula her given to one that has been in use in several booking gians. and art mirror factories in the city of London



APPARATUS REQUIRED FOR SILVERING GLASS.

themicals used must be of absolute purity (chemically pure) and all operations in preparing the glass must be carried out with care and scrupulous cleanliness The surface to be silvered must not be pressed une by the fingers or thumbs they would leave an indelible impression

The first thing to be done to to make a -The first thing to be done by to make a small table out of a piece of slatt about %, or 12, link thick 10 or 12 linches wide and 18 linches long. These measure-ments are not bluding, any piece of slate about the above size will do. A wooden trough must be madegrooves at the top edges for the slate slab to re There must be a some of 2 inches between the In There must be a space of 2 Inches between the shats sids to the woods bottom as indicated in Fig 1. In this space is a cell of pipe arranged as shown in Fig 2. The pipe to of short N, inch bore and through it steam is passed to raise the temperature of the side sids to should 1.0 deg F. In fact just hot enough for the hand to bear. The steam can be supplied from an ordinary ten kettle place down earth depositing table with a rubber tube connecting the cell to the specul of the kettle. Herbers, banderich the date the should the kettle. Uniform heating of the slate slab is eason tial. The coll can be easily made of ¼ inch iron gas piping screwed into Ushaped cast iron connectors, as shown in Fig. 2. The slate slab can be covered with black oile loth and made perfectly level. The following stock solutions must be made up and carefully filtered through absorbent cotton ready for use

Stock Bolution A - Nitrate of silver 3 ounc tilled water 10 ounces strong water ammonia 12% ounces. This solution must be stirred well and allowed to stand five or six hours, then add 10 ounces. more of distilled water and filter

Stock Solution B -- Rochelle salts 4 ounces, distilled water 20 curren

Stock Solution C Distilled water 40 ounces, protochloride of tin 5 grains

Clean the glass plate or plates with very line rouge and water taking our that no trace of grease whatso tver comes into contact with the glass or the cloths or chamois leather used for polishing. When cleaned the plate must be flooded all over with the tin solution Pour this solution of and wash the plate well with distilled water. Las the plate wet side up upon the table with four clean wood wedges at each corner Let the glass test on the wedges so as to allow a slight adjustment if regulard for leveling. The mix ture for allvering is made up as follows

Distilled where 20 ounces stock solution B I drackin by measure stock solution A tounce by measure The glass plate being quite level and still set pour this mixture carefully and slowly upon the con ter II will flow events all over until it stends shout one-lighth of an inch deep all over the plate. Any tendence to run to one end must be rectified by the The plate now being completely covered with the silvering mixture must be left to itself for about two hours the heat being kept up during this thouse and when it is found that the whole of the silver has deposited the liquid must be poured off by tilting and allowed to run into a stoneware crock and saved Scientific American

for the waste silver it contains. If it is desired to increase the thickness of the deposit of silver, the op-eration must be repeated as soon as the silvering in complete, wash the plate well in a soft stream of run-ning water, stand it cornerwise to drain and dry When dry the following protective varnish must be as a coating to protect the deposited silver Shel isc, 1/2 pound, wood sicohol, 6 pints As soon as this use, ½ pound, wood aiceond, 5 jirite. As soon as troching has dried it must be painted over again with the following paint. Red lead ½ pound, white lead, ½ pound, mixed with enough boiled oil and a small quantity of jurys after to make a good covering with a single conting. A small quantity of gold size must also be dided to insure quick drying and a tough adhermance. ing quality. The mirror is now ready for framing if much work has to be done, it will be advisable to cover the slate all over with a place of felt, and keep the felt wet during the operation for two reasons.
First no pieces of woollen fiber can settle upon the plate, and secondly, the heat from the slate slab is communicated to the glass better than from a dry sur-

regular workshop a very go feet with a guiter cut around the siab, so that the spent silvering liquid can run from the tilted plate, around the table and be collected by running through a hole at one corner in this case the liquid will be sure to come in contact with the felt. This will prove of no consequence because in time it will become sat-urated with silver, which will realize twenty times its first cost when sent to the silver refiner, and not only pay for a new felt covering, but increase the siz the pocket book at the same time. The quantity of nitrate of silver required to coat a square foot of glass with a moderate coating of silver is 18 grains estimate as to cost can be made from this amount An

# SELENITY CELL WITH CONTACT BY PRESSURE

The usual method of making a scienium cell con wists in prewsing the electrodes against a piece of crystallized scienium, which decreases its resistance to electric current, when submitted to the action of the The quality of selenium can be perfectly con tiolled, as it needs not come in contact with motal when fluid in which state it dissolves nearly all metals (1 c, the electrodes) This is of importance, because small quantities of other elements sometimes have considerable influence on its sensitiveness. More over a piece of selenium, that for some reason has los over a piece of seconium, that for some reason has lost the efficiency, can be easily replaced by another plece, at low rost. The most important point, however, is that the contraction or decrease in volume (5 to 8 per cent), which is inseparable from the process of crystallization, has no influence whatever upon the tact with the electrodes, as the ploce of sel-



SELECTUR CELL WITH CONTACT BY PRESSURE.

given its definite form after the contraction has take Strong currents of short duration do not lead to the destruction of the cell, as there is full scope for expansion

Despite these important facts, this method has not been hitherto used because very thin plates of selen inm are necessary as the action of light is limited to an extremely ithin layer of the exposed surface (cal-culated by Marc to be about 1/500,000 inch thick) Moreover, selentum is rather fragile and being of high resistance heavy pressure must be used in order to realize good contac

The author discovered that selenium, when molten between a cold and a very hot glass plate, strongly ad heres to the latter, after the crystallisation. It is thus possible to cover a thin (1/250 ipch) flexible glass plate with an exceedingly thin coating of selen ium (1/1 000 to 1/30 000 inch) which has a highly polished surface that gives very good contact with the electrodes. These consist of gilt stripes on a glass plate (Fig. 1). There are from 250 to 2,500 electrodes on every inch

on every inco.

Cells constructed after this method are very reliable
and show remarkable constancy. They are of small
specific working surface. The following is a descripition of a cell actually made.

Working surface = 14 by 14 inch Resistance in the dark = 20,000 ohms.

Rosistance in ordinary daylight == 10,000 chms. Resistance in strong light=3,000 chms. Maximum intensity of current=0 0018 ampere

Fig 2 gives a diagram of the call.

Fig. 3 is an end view of same Glass plates with a thin coating of metal (silver) have before now been used as electrodes for substances sensitive to light This combination or at least the ults attained are nev

### SOME SCIENTIFIC AMBRESETS.

The Candle and the Funnel—Ask a person to ex-tinguish a lighted candle, two feet distant from his outh, by blowing through a common tin funnel with his lips applied to the stem Almost invariably, he will fail to accomplish the feat, although he could easily have blown out the candle without using the funnel Now put your own mouth to the stem of the funn now put your own mouth to the stem of the runnel and blow out the candle If you have any skill in per forming tricks you can repeat this one many times without betraying its secret to the average speciator. The secret is this When you blow into the small end of a funnel, your breath follows the inner surface ond or a runner, your reast notions and not not the cone, and not only shous the axis, but produces cddles of such a character that there is actually a slight back draft or inward current at the center of the wide mouth of the funnel You, therefore, hold the



RIGHT AND WRONG WAY OF BLOWING OUT A CAMBLE

nel so that some part of its conical surface would, if extended, strike the candle flame An inexperienced person naturally directs the axis of the funnel toward the candle and consequently fails to extinguish the flame if he stands quite near the candle and blows gently the flame will even be drawn toward the funnel by the inward current. The whirling motion of the air may be made visible by using a glass funnel and filling it with tobacco smoke

adoxes of Ebullition.—Everybody knows that Pa water boils at the temperature of 213 deg Fahr if an uncorked bottle partly filled with water is set in a saucepan containing water in which a good deal of salt has been dissolved, and the pan is heated over a spirit lamp or otherwise, the water in the bottle will begin to boll while the water outside still remains perfectly quiet Yet the water outside must be at least as hot as the water inside (212 deg Fahr), for the latter is heated by the former Hence we see that water which contains salt in solution does not boil at 212 deg. Fahr The same effect is produced by dissolving any other solidesubstance in the water

Now, if the bottle is taken from the hot brine and corked, the water in the bottle stops boiling, but it will corsec, the water in the notice acops conting, but it will bell again, were after it has cooled many degrees, if cold water is poured on the upper part of the bottle. The explanation is that the boiling point of water is affected by pressure. It is about 212 day. Fahr under the ordinary pressure of the atmosphere (exactly 212 the ordinary pressure of the atmosphere (exactly 213) and dog when the harmonier stands at 20 Inches) but if the pressure is reduced, water boils at a lower temperature. When the water boils are a lower temperature when the water boils was cortool and taken from the fire, its upper part was filled with steem at atmospheric pressure, which had arguited the air originally present. As the bottle cooled, this seems partly condensed and tip pressure was diminished, but not sufficiently to permit the water to boil, because the water cooled also and its gradually diminishing temperature was always a little below the boiling point corresponding to the actual pressure. But the application of the cold water caused a rapid condensation of steam and a sudden lowering of the pressure without having much cooling effect on the water, which

without has ing much cooling effect on the water, which consequently began to boil.
Distribution—The same apparatus may be employed in the process of distribution. The same apparatus may be employed in the pass is replaced by fresh water, a hole to broad in the eops and a glass tube is fitted to the hole. To the water in the bottle is added one-tent its volume of alcohol, or less. The bottle and pan are placed over the lamp, as before, and beated gently. Before the water in the pan has reached the boiling points with a lib-range of the more roistlie sloohol (mixed with a lib-

tle water vaper) issues from the end of the giass tube, where its presence can be detected by its odor or by the application of a lighted match, which will result in the production of a tall blue flame. The jet should not be lighted until the mixture has been h nor we rigated until the mixture has seen heated long enough to expel the air from the bottle, as the ignition of a mixture of air and slochol would produce a vio-lent explosion. For this reason the cork, though it should be air-tight, should not be inserted too tightly snould be air-tight, should not be inserted too tightly With this precaution an explosion will drive out the cork, instead of shattering the bottle. This experi-ment, and the others performed with this apparatus, should not be attempted by children or careless per-

Hero's Founiain.—If the jet of films issuing from the tube is extinguished and the tube pushed down until it dips into the water, a fine liquid stream will



MODIFIED FORM OF HURO'S POURTAIN

be thrown high in the air by the pressure of the mixed vapors of alcohol and water in the upper part of the bottle --- Kosmos

#### A SIMPLE EFFECTIVE FILTER.

The filter here described was first made by the writer in 1878, and used originally for filtering gelatine emulsions. As a water filter it is both simple and effe Procure an ordinary kerosene lamp chimney Fit over the end of it two or three thicknesses of washed chesse cloth Press a tuff of absorbent cotton into the small part of the neck for about three inches in depth, ins



HOME-MADE PILTER.

the chimney, and place it in a hole cut in a weeden shelf as a support. Pour the water in until the fitter is filled, when it will be observed that any organic and tor, chips of fron rust, etc., will be rotained by the cotton The fine organic matter may penetrate the cotton for about one inch, but no farther The result-ant filtered water will be bright, clean, and pure

A paper dealing with "Research on Metallic Filament Lamps," by Mr F H Reakes Lavender, was recently presented at a meeting of the Birmingham Institution of Electrical Engineers. The research was undertaken in order to investigate the conditions of working as regards voltage, and afficiency and poreentage drop in candie-power, giving the most economical life in the in candie-power, giving the most economical life in the case of metallic filament give large, and to determine as far as possible the cent of limination with this source of light. The author stated that the useful life of a lamp, and the drop in candie-power which it was advisable to allow for a given voltage, depended on the cost of current and the price of the lamp. The chasper the current and the price of the lamp. The chasper the current and the price of the lamp. The chasper the defined by the control of the current at 64, per nutt a stated when the control of the current at 64, per nut as na average price, and the lamps are the voltage, then it paid in the case of the tantalum class of lamp throw throw it aways as one as the confidencement at father than its paid in the case of the tantalum class of lamp. then it paid in the case of the tantalum class of lamp to throw it away as soon as the candle-power had fallen is 3 per cent below its original value. This result ap-pared starting at first, considering the large initial cost of the lamp However, by the time that point was reached the lamp had been berning for 1,500 hours at the best possible effection, so that the cost of the lamp per decoming middle of the cost of the lamp had become small.

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he readjusted to position for use DISPLAY RAGY — A. Bloats, Lykens, Ya. This invention ristes more particularly to note racks as are perioded with frames, on which rans, walipaper or the libe can be suit. are further provided with means wherely any number of objects on display can be tempora-ted by the control of the control of the con-sisted one originally conceiled by the same of seconds of their super-position. y removed from the frames to disclose a de-region originally concealed by the same a Recount of their super-position POLDABLE TABLE AND ATTACHMENT

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### INDEX OF INVENTIONS

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## OTHER WORLDS IN SPACE

(Continued from page 180) graph is being taken. A careful of with such an accurate instrumen with such an accurate instrument will obtain the spectrum of the star in the middle of the photograph fanked on either side by the spectrum of the metal iron or titanium or the gas hydrogen, placed there by the use of the electric current and induction coil Astronomers use different metals for the purpose of comparison, the Yerkes Observatory, for instance, employs both iron and titanium on the same plate
A good photographic spectrum will the

consist of that of the star to be investi

gated, supplemented by the lines of gates, supplementally the lines of the comparison spectrum How are these spectrograms to be interpreted? And how can they tell us anything about stat-lar motions? Remombering that light is a wave motion, we have a simple analogy in the case of sound, and one with which everyone is familiar In traveling in an express train which passes another soing in the opposite direction, we have us noticed that the pitch or tone of the whistle or bell of the other engine sud-denly drops as it passes by us. The res-son is that sound is also a wave motion (though the waves are much different from those which cause light) and the quickly approaching engine causes more waves to crowd into our ears each second of time than it does when the engines are not moving. As the tone is determined by the number of waves which fall on the ear drum every second, the consequence is that the pitch of the whistle or bell is raised while the two trains are approach ing, and for the same reason it is lowered when the two after passing are going away from each other. The change in the of canage and the control of the con come into the eye Evidently the shift from the normal is excessively small, but even so, it is a measurable quantity for the astronomer with his methods of prechion A shift toward the violet means that the waves are crowded together and the star is approaching the earth, a shift toward the rear end of the spectrum sig-nifies that star and carth are separating from each other A measure of the shift gives the velocity of the star in miles per

The calculation of these velo the line of sight is now a great, fruitful field of astronomical research and many 64,000 field of astronomical research and many important developments have been made and it. It is a far cry from the small of the spectroscope that is ordinarily used in a sea constant of the spectroscope that is ordinarily used in a sea constant of the spectroscope of the spectroscope and its refined spectroscope. OAR 346 Yerkes telescope and its rafined spectro out set graph (Sciknrivic American, December 25th, 1909) This required not only vast improvements in the instruments them-selves but in methods all through as well improvements in the instruments themedia of the control of the con due more to Frot W W Campbell, directions to the Lick Observatory, than to any states of the Lick Observatory, than to any states of the man He has been a leader in all green and plant of spectracepts work, and his safety methods are largely followed wherever and the safety with the same largely followed wherever the are statempted, such as safety spectrum shows remarkably likewise and the safety spectrum shows remarkably likewise safety spectrum shows remarkably likewise safety spectrum shows the safety sp

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which is puzzing all American truth. His name is Charles Edward Russell.

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(Continued from page 170)
lons a photographic plate 12/3 x 4 inches some faint strenks of light about two inches long and possibly on sixteenth of up inch in width. This tells the whole story of the stars motion. Asturally this photograph is placed under the int rescove for examination and there it as pears magnified and is measured physical constitution of the Star the me tals that compose it is known from the lines of the stellar spectrum, hydrogen from instance showing its badge by a series of prominent lines. The motion of the star is shown by the placing of these lines, whether they are shifted from Ilmen, whether they are shifted from their hormal position as kiven by the comparison spectrum to the violet or toward the red end of the spectrum. If there is hydrogen the the spectrum of these of the hydrogen comparison spec-trum give the position of rest or sero-volocity with respect to the earth, and the amount of the shift measured under the microscope show the moster of the the microscope gives the motion of the trum of the star (as is usually the case) from of the star (as is usually the case) we can readily in an analogous fashion measure the motion. The photographs in the illustration were taken at the Yerkes Observatory with the great 40-inch telescope Two separate spectra are there shown taken but three days apart on lanuary 5th and 5th 1966. The star spectrum appears in each between the com-parison spectrum of Hanium and it is widened to make the lines more prominent and the whole greatly enlarged. The violet end is toward the left, red end to violet said is toward the left, red end to the right. Portions of the comparison spacers on both are cut away to bring the two closer. The numbers on the top give the wavelengths. Notice that all the lines in the lower spectrum are shiftto the comparison lines than in the upper spectrum. This is specially noticeable at line 4501 and better still at 4481. A measure of the amount of these shifts gives the radial velocity of the star with respect to the earth. The variable ve-locity in the line of sight of this star shows it is not a single star but a system Measures made by the writer on the star  $\beta$  Trianguli show the following results where the radial velocities are given in miles per second relative to the sun. The plus sign means that the star is increase ing its distance from the sun and s minus sign that it is moving toward the

1909--Bept 7 Sept 8 Bopt, 18 + 31 miles per second + 31 miles per second - 5 miles per se cond Ort 5 Ort 12 + 1 mile per second | 20 miles per second + 18 miles per second

The measures must be carried out with ntmost care. If the spectrum of the star numericare It the spectrum of the star is good with many well defined lines, the radial velocity (i e toward or away from us) may be determined to an accu-racy of one-to-thic of a mile per second Think of this when light travels at the rite of 186,000 miles per second wher six hundred millions of millions of waves enter the spectroscope every second and when in addition the star is so far dis iant that fix light even when traveling hundreds or thousands of years to reach us! To contemplate it makes our minds whiri at the enormity of space and causes us to how down in reverence to the wonderful human intellect that car solve such problems!

note and pronous.

Investigations of certain stars show us that at one time it may be moving toward our sun once in a few days or weeks the direction of motion may be reversed and it is traveling away from the sun. The star of itself is unable to change its mu-tion, and another body must be present

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arately, and hence we have a compara-tively are close of stars, those which ap-pear as single even in the most powerful telescopes, but whose motions in the spec-trescope show that they are really double smar. These are called proctrascopic binaries. Recent researches at the Link Otherystory, Terbas Otherstory and other places bring to our knowledge most starting results. Imagine to re suns each many times more massive than our many times more massive than our own, rapidly revolving about each other in a few hours! In addition to this comes the fact that at least one in every few stars so far investigated turns out to be not a single star but a system, and it bas become necessary to reconstruct our ideas regarding the importance in the universe of this small ball which we call Mother Earth.

#### Dying Pearls,

The last array of earlies the part of the

the controlling forces of society, by age and industrial minfortune, as well as by infancy, congenital incapacity, and weak-

The middle-aged and the socially inom-cient now form a relatively larger section of society than ever before There are two reasons for this The first is, that while there may not be as many children born now as formerly, among cartain people, of the number born a much larger portion reach maturity In other words portion reach maturity. In other words, the ratio of adults to a given number of births has increased. The second reason is that modern business methods and the modern corporation, especially the manu-facturing corporation, have created new rouditions and complications. They have added to those who join the dependent classes under a simpler life, those who become dependent because their active lives have been devoted to highly spe-

ialized work. Highly specialized labor is con Highly specialised labor is constantly menaced by loss of occupation, and this menace increases as the age of the worker advances. Under the figure competition (Continued on page 172.)





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(Continued from page 17.) which governs the greater portion of our industrial life, new processes, new methinventions, are all eagerly sought by the nventions, are all eagerly sought by une mployer of labor. Some of these are svolutionary in their effects. They call or a readjustment of the whole plant When that readjustment comes, the older men are invariably dropped. In short, the avenues which lead to employment, for all highly specialized labor, are pracfor all nighty specialized indor, are prac-tically open now only to youth. The middle-aged man enters with difficulty and the man past middle life substan-tially cannot enter at all. The man who did many things, none of them highly specialized from twenty to sixty five, is likely never to become entirely dependent upon society. The man who did some highly specialized piece of work which involved only a part of some specific thing, or even a part of a part, n ed into the dependent class before he reaches old age, and when he joins that class he is much more helpless than the nan who has done many thirgs. It is probable that the specialist, altough he labored fewer years, rendered society the more valuable service of the two, and that therefore he has, morally at least, a that therefore he has, morally at least, a clearer title to consideration. But have ever that may be, he is the inevitable product of the whole plan of society and business, and the obligation of the man who employs him and the interest of eral society in what finally beco of him, are clear and unavoidable class must be shown how to protect itself against the menace which it con stantly faces or that it must be helped outright after disaster or age come are

There can be no question that a system which teaches these people how to tect themselves against this menace more in harmony with the genius of our institutions than a system which coerces them into action or a system which final ly places the burden of their support and care upon general society. It does not follow that a system which works well in Gormany would work well here, or that a system which appeals to the needs of the people of Great Britain will answer here. There are distinct advantages in the German plan,—chiefly that it is com pulsory and that the laborer is forced to make provision for certain benefits though he may have no very intelligent understanding of the wisdom of the plan or its effects on society. There is a dif-ference between the compulsion of gov ernment, which tells the workingman that ertain thiuss must be done. and the sition of a corporation which tells a man what the conditions of his hiring

connelling facts in the sociology of the

If the conditions named by player involve some system of life insur-ance some system of deferred annuities, a man can study the question and take a ommends itself to his judgment or other ommends their to his judgment or other wise. This is a slower process than the German method and probably for a good many years will be more expensive, but it seems to me to be in harmony with our notions of individual responsibility and the rights as well as the obligation Ametican citizenship

The efficient employee, in specialized labor, has a fair claim to something be nary contract of hiring This right may be strengthened and its realization advanced, but it cannot directly be met, in this country, by governmental action The capable worker deserves and should lemand a programme of hiring under by contract not by the grace of his om -to certain protection for his fam ily if he dies prematurely, and to certain protection for himself if in the vicissi-tudes of industrial war he is shelved and wholly or in part compelled to join the dependent class

There are sound reasons why corr (Concluded on page 174)

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ork of the highly developed system of responsible insurance institutions of this and of other States. Any effective sys-tem if established by corporations inde-pendently, will be based on the principles and methods used by the insurance com-panies, and therefore the work for ob-vious reasons is in the end likely to be more effectively and more economically does by mer who are vertex and asmore effectively and more economically done by men who are experts and spe-cialists than by men who undertake it with no special training and with minds chiefly occupied by the demands of other

(Concluded from page 178)

I shall therefore assume that life insurance, and probably other types of in-surance including accident and sickness insurance, as represented by existing cor-porations is not only well equipped to help in the solution of this problem, but is a part of the evolution of the times which has produced the problem itself, and is another illustration of the curious fact that in the processes of evolusolution of a problem often appears the same time the problem itself is evolved For example, what might have happened in the enormous industrial happened in the enormous industrial activity of the United States and its necessary output of securities seeking purchasers if millions of people combining their small savings in the reserves of the great life insurance companies had not appeared upon the scene contempo not appeared upon the scene contemporareously seeking securities in which to invest their money? The function of life insurance and of other types of insurance on the one hand and the obligation of the employer of labor to his employers on the other, bear, it seem to me, an identical relation

latentical relation

Life insurance is already effectively at
work While the employer of labor has
only in the most limited way used the
idea or appreciated its beneficence, progreas has been made toward the solution of this problem Eliminating industrial companies and including only those com-panies whose business is supposed to be confined to people of means, we find the confined to people of means, we must see average policy the country over is a little under \$2,000 In other words the mass of so-called regular insurance is held by people of small means. If now we add to these the millions who carry what called 'industrial' insurance, and called 'industrial' insurance, and the other millions who have so-called "fra ternal' insurance we have covered sub-stantially the whole insurance field. We comprehend an interest whose accumu-lations surpass those of any other single-line of human endeavor except the ac-cumulations of savings banks, and yot wo have not gone outside of what may erly be called the laboring class erry be called the laboring class. The energy of life insurance management, in other words, and the obligation which the laboring man feels toward his family have in their development far outrun the sense of obligation of the employer We ployer is beginning to do his part—but as yet he has only made a boginning. That he will do more is certain, that he will do That much is almost equally certain. That existing insurance institutions will be utilized is, I believe, a necessity

Alloys Formed by the Compres Metal Powders,

The ordinary method of preparing al-The ordinary method of preparing al-loys consists in meiting two or more metals together, and allowing the meit to crystallise after cooling. Can not the same alloys be obtained by compressing the component metals at ordinary tem-peratures in the shape of fine powders! Dr W Spring showed as far back as 1832 that under a pressure of 5,000 atmo-spheres the powders of the constituents of the Rose and Wood alloys will form of the Rose and Wood alloys will form conglomerates, the melting points of which nearly coincide with those of the alloys obtained by molting in 1338 Hal-look showed that by mersy in 1358 Hal-look showed that by mersy in 1358 Hal-tod that by mersy in 1358 Hal-tod have pressures the powders of the same constituents there is obtained a mixture (Concluded on page 176.)

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difference or was a second of the second of

of the matter in this book has never beliabed, as, for instance, the vacuum di-regulating processes, the stacking of all a condensers, the construction of inter-ming switches, the set of complete we, the cost and purchase of materials as the cost and purchase of materials materials along introducer or value's its which have have before been public

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ponent By compressing zinc and copper powders, Spring obtained a conglomerate which was distinguished from brass only by its slightly darker color

by its singitly darker color in spite of these partial results the problem had not so far been definitely solved it remained in fact to be seen whether, by augmenting the speed of fusion of the mixed metal powders, prossrussion of the mixed metal powders, pressure really favors the formation of those compounds which are characteristic of alloys obtained by molting This question is answered by Prof G Tamman on the basis of recent experiments by G Massing. Masing

When submitting a mixture of filings of two metals forming neither a chemical compound nor mixed crystals (e.g., zine and cadmium or copper and silver) to a pressure of 4 000 atmospheres, and heat pressure or 4 own atmospheres, and near-ing the conglomerate thus obtained the rising curve of temperatures is seen at a given point to slackon down after reat-ing a temperature 10'4 deg C higher than that at which the whole is found to As far as its thermal properties and its atructure are considered this conglomerate is practically identical with alloys obtained by melting

Again by compressing under high pressure the powders of two metals forming a definite compound and capable of mixing in all proportions in a liquid cou-dition and by heating the conglomerate thus obtained, two stopping points are found in the curve of temperatures first of these points corresponds with the melting of a compound formed at the sur face while the other corresponds with the formation of the alloy. This is the case for instance, with mixtures of magnesium with zinc lead tin or bismuth. The conglomerate composed of magnesium and giomerate composed or magnesium and antimony has only a single stopping point situated at 300 deg C below the melting point of antimony This corresponds with the formation of the compound Mg.Sb. The temperature then rises

rapidly in order to eventually fall down to the melting point of the alloy. The to the conglomerate of two metals forming an uninterrupted series of mixed crystals, such as magnesium and cad mium on the one hand and lead and thal conglomerates only a single stoppin point is observed corresponding to th point is observed corresponding to the melting point of the most fusible com-ponent. The form then assumed by the curve depends on the diffusion of the two components into one another. The conglomerates obtained merely by

compression do not contain any trace of mixed crystals Microscopical examina tion thus only shows the existence of grains of copper and tin in recently pared conglomerates If, however these mixtures be heated to 200 deg C (i e, below the melting point of the tin) there are found between the grains of copper and tin, two layers corresponding to the compounds Cu, Sn and Culin respectively If these conglomerates be heated during 20 hours to 400 deg a layer of mixed crystals, corresponding to the formula Cu<sub>3</sub>Sn, is found. This proces that com-pounds of these metals are permeable to

The following conclusions are

om these experiments The compression of two m nary temperatures will yield conglomerates containing only the pure metal 1 e neither compounds nor mixed crystals as wristle of alloys obtained by meltcharacteristic of slicys obtained by met-ing. Mere compression thus does not activate diffusion sufficiently to bring about combination or the formation of mixed crystals if, however, heated met-als (i e., with increased speed of diffu ais it e., with increased speed of diffu-ation) are submitted to pressure there is obtained not only a more coherent mass, but a portion of the metals is found to form compounds and mixed crystals, so as to produce a conglomerate which is very much like a real alloy

melting at a lower temperature than the melting point of the most faulthe com-

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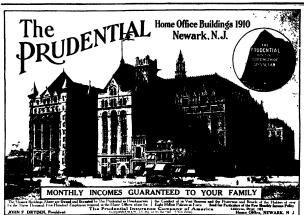
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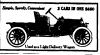
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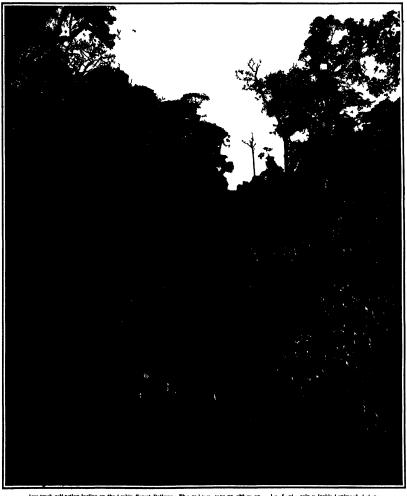
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# A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS



I wo-track self acting facting on the Cothin Forest Railway. The railvy pass up =00 mg ar — i = f xt - nely v lumble lardword index A LOGGING RAILWAY TERROPOR THE COCKIS SUSSEL SOUTH HERLA—(No. page 186)

#### SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, BATL RDAY, FEBRUARY 26th, 1910 or is always gird to reveive for examination illustrated arter of timely interest. If the photographs are sharp the artic-tile facts englantic the contributions will receive spec-Accounted articles will be past for at regular space rates

#### THE COMMISSIONER OF PATENTS' ANNUAL REPORT

HE annual report of the Commissioner of Patents Hon Edward B Moore, for the fiscal year ending June 10th, 1909, has recently been published and contains several useful suggestions for the improvement of the office of value to inventors and natentees

to inventors and patentees
Referring to the work of the office, he says
There were received in the last fiscal year 62 800
applications for mechanical patents 1 188 applications
for designs, 192 applications for releases 2 052 caveats 7,509 applications for trade-marks, 1,001 applications for labels and 138 applications for prints There were 35 215 patents granted including relasues and designs and 4 547 trade marks, 779 labels, and 231 prints were ed The number of patents that expired was The number of allowed applications which were by operation of law forfeited for nonpayment of the final fees, was 6,763

"The applications for patents for inventions have "The applications for patents for inventions have increased over last year by between 4,000 and 5,000 cases. The applications for trade-marks, however show an increase of only 42. The number of trade-marks registered shows a decrease of 1,598.

"The 'act to amend and consolidate the acts respect-ing copyrights," which was approved March 4th, 1909, hich became effective July 1st, 1909, repeale act approved June 18th, 1874, under section 3 of which act approved june 18th, 18th, unner section 3 of water labels and prints have been registered in the Patent Office Consequently no certification of registration of labels or prints have been issued since July 1st, 1909, except those pridancing registrations effected, on or beexcept those evidenci

"The money receipts from all sources ware \$1,975,-919 97, and the expenditures \$1,887.443.35, leaving a net surplus of receipts over expenditures of \$88,476 83 The grand total of receipts over expenditures for main ng the bureau from 1836 to date is now \$7,060,547. This vast sum represents the earnings of the Patent Office, and the bureau is therefore more than self-sup-

Owing to his success in securing additional appro-priations from Congress in 1908, the salaries of the praktions from congress in jow, the samines of the examining corps were increased on July ist of that year, resulting in a noted decrease in the annual resignations. Owing to the additional force he was authorised to employ and the ritention of the skilled szaminers, the work in nearly all of the examining. divisions of the office is practically current to keep the work current in all branches of the office. if po ible, which is certainly a most laudable pure, and one that should be carefully considered by Congress He says

Congress He says
"The rapid increase in the number of applications
filed and the constantly increasing field of search embracing as it does not only United States and foreign
patents, but also publications of every character, make
it imperative that additional force be provided each

year to prevent accumulation of the work."

He has asked for one new principal examiner and twenty additional examiners to further the work of lassification of patents. There are now 930,000 United States patents, approximately half of which have been reclassified Over 2,000,000 foreign patents and nearly 90,000 volumes of the scientific library remain

The models formerly stored in the basement and on the first floor of the Patent Office building have been moved to another fireproof warehouse a short

Additional space for the storage of new volumes of foreign patents by at least 150 linear feet per an num should be provided for in the office library An

appropriation of \$2,000 for this purpose, which it is thought will be sufficient for a period of five years, is

recommended
The space available for the storage of printed classified copies of patents is becoming crowded and the
acrommodations in the atterneys' and public search
room are becoming insufficient for the work done there One of the long hallways that has bee apart for this purpose is in a congested condition is inadequate for the purpose Some changes to afford temporary relief are suggested by remodeling the basement on three sides to conform to that of the Ninth Street front

He believes that the time has arrived when measures should be taken to secure the construction of a new larger building in which ample room will be afforded to properly and promptly transact the bust su of the office. He save particularly

"It is necessary that patents for new inventiona-should be issued with the utmost promptness after the should be issued with the utmost promptness after the application for patent has been filed for such inven-tions form the basis of vast industries, which inure not merely to the profit of the inventor, but to the benefit of the manufacturer the laborer, the trader, the professional man, and the consumer, and to the commer-cial interests of the country in general Great Britain and Germany have each recognized the necessity of providing ample facilities for the work of their patent bureaus, and have each recently erected new buildings for their patent offices, which are in every way more commodious and better adapted for the business of a patent office than the building which now houses the United States Patent Office, although the patent bust each of those cou pared with that transacted in the United States Patent

He urges that the new building be located near He trigger that the new building be located near the Congressional Library on a square north of that building as embodied in Senate bill No 1,864, intro-duced by Senator Daulel, January 24th 1888 The surplus to the credit of the Patent Office in the Treas-ury Department of \$7,086,847 he thinks would go far rd paying the expen se of the building

As to future desired legislation he continues his endation in previous reports by advocating an amendment to the statute which has for its object the rtening the course of appeals from the primary examiner (in . x parts cases) to the board of examiners in chief and the Commissioner by combining the board of examiners in chief with the Commissioner of Pat or examiners in enter wint into Commissioner or ra-ents and his first and second assistants into a singli tribunal, any three of whom shall constitute a quorum to which all appeals shall lie, whether from a primary examiner or from the examiner in interferences and from which appeals would lie to the Court of Appeals from which appeals would lie to the Court of Appeals of the District of Columbia The elimination of one appeal, he states, would materially shorten the time required for the ultimate disposal of appealed cases and effect a considerable saving of expense to appli-We believe there is much merit in this reco mendation and trust it may receive favorable consid-

A further additional provision recommended is the amending of section 4 889 of the patent law by re-quiring to be filed with the drawing two photographic copies thereof with the application. One of the photographic copies is to be kept in the file wrapper and the other is to be filed in secret archives in charge of the chief draughtsman while the drawing itself will be kept constantly in the office of the examiner and will be available at all times for inspection in their re-spective divisions He states there have been cases spective divisions 110 states there have been cases of fraud in withdrawing and substituting other draw lags for the originals and that some such plan is needed to detect possible unauthorised changes We think it would be more practical for the Com-

nissioner to have the negatives made of the drawing at the time the application is filed, and withhold the delivery of the filing receipt until the official photo-grapher had certified the photograph as being an exact reproduction of the drawing
The Commissioner advocates the form

'patent bar," and suggrests before an individual be permitted to practise before the Patent Office be will be required to pass an examination as to his moral, ical qualifications before a con appointed by the Commissioner of Patents, composed appointed by the Commissioner or Patenta, composed of officials of the office and putent attornays of well-known standing in the profession, who shall conduct the examination under the direction of the Commissioner The report of the committee is to be subject to his approval. This suggestion appears to us to be very appropriate

In regard to the amendment and improvement of treaties with other countries concerning industrial property, it is proper to say Commissioner Moore has been most successful in securing advantages for Amer-ican inventors. He says on this subject

"I am gratified to report that during the last year a treaty was negotiated with Germany, which confers great benefits upon the American inventor. The patent laws of nearly all the foreign countries contain a clame providing that it as investion is not that is, manufactured or practiced—its such country within a certain period, ranging from two to four years, the patent may be annulled. This treaty with Germany norther than the second of the sec years, the parent may be annuared. This crossly was fermany provides that the working of a patent in one of the contracting countries will have the same force and effect, so far as avoiding the revocation of the patent is concerned, as if it had been worked in the country in which the patent was granted. This treaty ctically assured to American inventors the prohas practically assured to American inventors the pro-tection of their rights in Germany during the full period for which the German patent is issued, con tingent only on the working of the invention in one of the two countries

"It is understood that Sweden has modified its laws to extend similar protection to other countries wh do not require the working of the invention within a specified period, and negotiations are now pending with nearly all the European states for the promulgation of treaties of the same character. In order to asist in the negotiations of these treaties, I have delegated by the Department of State, and with your permission I shall visit the capitals of several foreign nations to assist, so far as within my power, in the otiations of such treaties, which if concluded will greatly extend the protection of inventors, manufa ers, and the industrial interests of this country, as well as those of the nations with whom such arrangements may be made

ites the next International Convention for the Protection of Industrial Property is to be held at Washington, D C, in May, 1911 About this he is most sanguine and enthusiastic. He save

meeting of this convention is most in to the interests of the American inventors and many facturers. The 21 nations which are adherents to this union will be represented by delegates having full ower to negotiate agreements in respect to the re-procal protection of patents, designs, trade-marks, ciprocal proand industrial models, which when ratified by their respective governments will have the force of treaties. The efforts of these conventions in the past have been crowned with success the agreements relating to the reciprocal protection of patents and trade-marks having been ratified by all adherents, which comprise the leading commercial nations of the world and the Con gress of the United States has in each instar ed the patent laws of this country to accord with the terms of the international agreen these conventions

Not only are the memb t only are the members of the union represent legates but all other civilized nations, not m by de bers of the union, are invited to send representatives in the interest of furthering the reciprocal protection of industrial property. It is expected that at this com-ing convention a strong effort will be made to harmonise the laws relating to patents and trade-marks throughout all countries in such a manner that ade-quate protection will be given to an inventor, no mat ter of what country he may be a citizen, without the necessity of obtaining expensive patents in each of necessity of obtaining expensive patents in each of the several countries in which his invention may be used or sold. It is also proposed to perfect and extant the international registration of trade-marks and thus further the reciprocal protection of commercial indus-

#### THE ALL-STREE CAR THE CAR OF THE FUTURE

OR many years past the Scientific American has strongly advocated, on grounds of public health and safety, the building of all-steel cars for railroad service, and we are there cars for railroad service, and we are there froe much gratified to learn that the Pennylvania Railroad Company is adding to its steel-car equipment at a rate which promises, before many years, to elimi nate the present woodon ear, and provide that great system with an allested passenger car equipment is was on August 12th, 1964, that that railroad, an onunced that all future passenger equipment would be built of steel and that the design would be such as to render it indestructible either by collision or fire planning the cars and establishing those stan e stand yearning the curs and establishing those standard types which are now being copied in all the new equip-ment, no expense has been spared to build a coach which should provide the greatest possible strength. and finish it with an inside lining that short and min it win an inside litting that should be ab-solutely unbornable and possess the added and not inconsiderable advantage that it would be a poor con-ductor of heat and noise. The first order, placed in November 1906, was for 100 cars. Subsequent orders have been given, and there are now in service \$45 coaches, 10 dining cars, 21 combination passenger and baggage cars, 29 baggage cars, 18 postal cars, and 1 company car, making a total of \$24 steel cars, thermore, the Pullman Company has been build: ag for toermore, the Funnan Company as been summing for the railroad during the part four years some all-steed parlor and sleeping cars. About 500 of these will shortly be placed in service With the present steel eculpment and terms 350 cars to be ordered during the present year, the Pennayivania railroad will in a short while have in service 900 of the own steel



# ENGINEERING.

In a paper recently read by Mr Henry Hess before the American Society of Mcchanical Engineers on the power lost in being, it was shown that 50 per cent of the power transmission jest was due to journal friction. This may be materially reduced by substitution of ball for plain bearings, provided care be taken to sutt the size of the balls to the load.

The Committee of the American Railway Mainteesectway Association in a recent bulletin takes up the subject of rail specifications. For Beamers rails of \$5 to 100 lb. it recommends the following composition Carbon, 045 to 055, manganese, 085 to 115, hopepherus not to exceed 010, and sulphur not to exceed 0075. The recommendations for open-bearing test for the same weight of rail, carbon, 085 to 076, manganese, 078 to 100, phosphorus not to exceed 004, and sulphur not to exceed 008

The two latest German dreadnoughts are to be equipped with turbines, and special luterest attaches to the fact that two rived types of turbine, the Parsons and the Curtie, will be tried out against sach other The "Heindal" will be propelled by triple serves operated by Curtie turbines, and the sister why will be equipped with Parsons turbines of equal contract

A method of simultaneously excavating and lining vertical shafts is contemplated in one of the contracts for the Catabilli water supply. In the shaft will be suspended a lining platform, from which but concrete forms will be erected and concrete little. The excavating will be carried on below, the material being loisted through a hole in the center of the plat

norm. The weekly noded in these columns the mold in crease in the weight of too monitors. A similar proverts to the property of the property o

Apropa of marine turbines we note that Messre Persons & O., recognizing the advantages of twinserow propulsion, as proved in the Curtis equipment of the scott 'Selsem', have developed a modified curtis partial admission turbine which they are to install in one of the new \$500-ton 28-kmto Hirthis scotts. A turbines will weigh 340 tons, and guaranter soll prover on 13 pounds of dry steam per horse-power per heur. The Curtis turbines will weigh 250 tons and guarante 125 pounds of superheaded steam

There are persistent reports that the Hamburg American Line is about to build two huge steamers which will rivel the White Star liners Olympic and Titanie, which are to be in service during 1911. The reported dimensions are Longit, 560 feet, Neam, 92 feet, and depth 66 feet. Reciprocating outpines of 46,000 knore-power will direct the align at a speed of

A recent bulletin of the United States Geological Survey give some statistics of producersys power plants in the United States which are very favorable There are over 500 plants in operation, aggregating, 115,000 horse-power The government teating plants at 8t. Louis and Norfolk show a fuel consumption of as low, under favorable conditions, as 055 pound per electrical horse-power Comparative issis of 75 grades of bituminous coal under steam hollers and in producers show a ratio of 37 in favor of the latter

One of the meet important branches of the general schema for the development of Japan is the extension of her railroad development along predetermined lines which have been laid out with an eya to the development of the event in this development was the recent completion of the railway between Historehi and Kageshima, which connected up the last like in the trunk unknown of the trunk of the trunk of the trunk of the lain of the major which connected up the last like in the trunk in the country of the lain of the lain

A premising installation of a windeallishectric also premising installation of a windeallishectric production of the production of the production of the lands by J. G. Childe & Co., of London II toosistes of a 24-foot wind turnise carried upon a 75-foot tower. The generator is located at the foot of the tower, the bestery and writeholoard in one of the outstallings or the house. Overhead copper cables carry the currant is the heatery some 657 pred datasit. The generate is the heatery some 657 pred datasit. The generate is directly some 657 pred datasit of the generate is directly some 657 pred datasit. The generate is directly some 657 pred datasit. The generate is directly and the production of the pred to the pred to the pred to the pred to the wind turnishe. It has a fauntimen capture of 4 kilowatta with a neemal presence of 70 volts. The plant runs about 100 lights in the beness, and serves also to drive a charf outlow, a circular saw, and a rootpulphing machine.

## Scientific American

#### ELECTRICAL.

A company has been formed in London to introduce and encourage the use of electricity in the poorer distircts of the city. The company agrees to wire and supply any apartment of three rooms and over with statulum lamps, charging five crats a week per lamp from April to September and seven cents a week for the rest of the year. The lamps however must be renewed by the consumer.

A new mounting for nestallic filament in lamps has been devised in Germany. The mounting provides to the shrinkage of the filament which is not always uniform, and for this reason each filament is supported at its lower end on a small spring which is overed with a paste of finity powdered tungstes so as to prevent it from being consumed by the heat of the incendescent filaments.

of the incendescent filaments
The use of the telephone for train dispatching is
alowly appracting The Gulf, Tozas & Western Raliroad is equipping its line with a telephone system for
train dispatching between Jacksbore and Benjamin
trass. The road connects the Chicago, Rock listend &
Gulf and the Wichlard valley railreads
when the telephone system on the Bipolame division of the Great
Northern Ralissy is completed there will be 2100
miles of this railread operated by means of the telemiles of this railread operated by means of the tele-

payable-altestes plant in the listone Mountains about 38 miles from Neiobnam, Ispan has revently been completed and is particularly interesting for the first that must not the apparatus used is of Japanese make. The Shibaura Ricetric Manufacturing Company of Toklo has built the 60-kilowest air-coled, oil immersed transformers to b. used at the substantion in Volchama. A large number of the high tenden of About omethird of the line is supported on towers which is a new departure for Japan At the power station the water is carried over a distance of 1 1000 generator units in upper half of the tiple lines consists of riverded pipes made by the Shibaura Company and the current which is generated at 3.50 voits, is stopped up to 8.6000 voits for the line.

In a resear number of the Electrical World appears an interesting article on the wireless telephone and the author arrives at the following conclusions: it is, then quite evident that fruit respairs of wireless telephony must either eliminate the one of these used today. In addition to this, some more of these used today. In addition to this, some more stituted for the art if no grant difficulties arise in its operation and its cost be sufficiently reduced this usualitated may be the high frequency alternator With the few weak points of the present system related, the wireless telephone will come into all the moved and the usuful parts of the appearance related, the wireless telephone will come into all the defects will increase a construct from present method until these are discarded, attempts at commercial wireless telephony will be frative.

The following useful electrical shop kink was judished in a recent number of the Slectric Railway Journal describing a method of soldering broken or burnedout vires without removing them from the armsture "The danaged wire is raised a little way out of the sold. The insultation is then arraped off for a few inches and the ends of the broken wire arrested off smoothly after which a place of wire is cut to fill the gap One and of the inserted wire is then obtained with the armsture wire and the ends heated by the gap of the second of the inserted wire is then the second of the place of the second of the inserted wire is then the described between the second of the inserted wire is then controlled the second of the second o

It is reported that at the time of the receive of the seamally "Kontucky" by the "Alamo," which had been summoned by wireless telegraphy, the writess apparatus had almost been put out of commission by the water that partially submerged the dyname. By wrapping the dyname may be a summoned by wireless apparatus that partially submerged the same than the same of a rescene due to the help summoned by wireless relegraphy, and on a previous occasion the suparatus was put out of commission by the encrear-lineates of the water. It has been suggested that storage batteries should be used to supply the current, because they could be justed that storage batteries would be impractical owing but a storage batteries would be impractical owing to the motion of a vessel in a storm, some arrangement should be provided for placing the dyname and agasotice engine for driving it well above the danger

#### SCIENCE

Recent experiments have proved conclusively that coal dust which has been ground to a state so face that it will pass a 200-mesh sieve, will explode from contact with either a naked flame or with the arc of an electric current.

The building of an observatory on the rim of the great crater of kilausa has been advocated for several years. The prospects are now brighter than they ever were, and it seems likely that the observatory will be built as part of the follogs of Hawaii

A recipe for a non-shrinking alloy to be used in duplicating nations, is given as follows by The Metal Industry Tin, 50 pounds, sinc, 50 pounds This gives a tough hard metal that runs well if a good rated of rine is used The addition of 2 pounds of binsuits will render it even more fauld and enable it to be pound at a lower temperature ity using his to spread pounds of the shrinkage which is slight, may be largely overcome

Prof. 20 Bearand recently obtained a photography of liality's come showing a tail our degree long. The comet is beginning to wake up. Mr Ellerman will sail for Honolulu on March 38th to observe the transit of Itality a comet across the sum's disk. He is sent out by the comet compittee of the Autronomical and Assembly the comet compittee of the Autronomical and Assembly the Comet Compited with the Compited Compited

During the night between 0 toker 7th and 8th, 1989, a meteoric atoms fell to earth on the farm of W. P. Nikkerson, of Norwood Mass: The meteorite is a Manushaped mass of very hard gray stony material, nuch corrugated on the surface, about two and one-half feet long in this greatest dimension one foot to nearly one and one half feet long dark daying from section to extend from the thrift dimension. Its own foot to overshift fout in the third dimension. Its weight as perhaps 275 pounds, and its dranity as not much over 2.5.

Besides Halley's Conict two other comets may be expected in 1910. The first of these is Tempel's, discovered July id, 1971, at Milm: It has a period of 575 years. It was observed in 1873–1894. 1899. and 1904. It has passed perficilion in November. It ought therefore, to be expected this spring.

The second of the expected comets is that of Arrest, discovered in 1851 and the return of which is expected in the summer of this year. It was observed in 1877, 1870, 1877, 1870 and 1807. It was unfortunately placed in 1804 and therefore could not be observed.

The shift purpose of the semal proof room at the lutherwisty of Dunks in the insuring of perfect free dom from sounds from outside its building it on philatorss of thick lead and co-most and by controlled in its walls of many thicknesses of fell, cork, abselved, and other bed conductors of sound vibrations, and other bed conductors of sound vibrations, on the controlled conductors of sound vibrations that the beating of one's mucles in at once heard on taking up a post of the controlled controlled in the controlled controlled in a submoving or of sounds only defect of it as a laboratory for acoustic experiments is tast verification is absent, and no one can remain in it for more than a hour at a time

Prof. Lipmana announced before the Academy of Sciences that Mustume Curle has obtained a tenth of a gramme of polonium with which she has been or perinenting. Polonium is a ratiosective element discovered by Madame Curle as early as 1885 but not of old the control of another body.

A special investigation of the motion of the bridge of the violin has been made by 1 W tilliar and TYP M De Itaas of Amsterdam. They conclude from their M De Itaas of Amsterdam. They conclude from their parallel as well as a transverse motion, and that the indirect of a violin performs a parallel as well as a transverse motion, and that the indirect of the motion is altered and the other tender of one of the motions is altered and the other have also explained the action of the motion and the In finance which the use of too thick or too thin a bridge has on the sound of a violin. The mute is commod purposed to "dampen" or "deaden" the sound. If the mute caused nothing but a general damping by reducing the bridge motion, the mute would only weaker the section of the state of

# A NEW TYPE OF SELF-DISCHARGING COALING VESSEL

BY F. C. COLEMAN

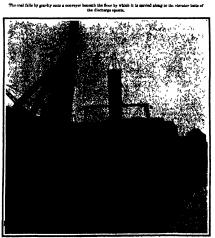
The new system of belt-conveyor discharge has been The new system of belt-conveyer discharge has been installed by William Dorford & Sons, Ltd., in a new vessel—the steamship "Fallion"—which they have recently built at the Pallion shipyard, Sunderland, England, to the order of the Dunrobin Shipping Comof Newcastle-on Tyne This ve length between perpendiculars of 270 feet, and a tength between perpendiculars of 210 reet, and a carrying capacity of 3,100 tens on a 17 fee, 10 faches draft. The machinery, comprising triple-expansion engines and multitubular boilers is placed aft. The cabin accommodation is fitted in

the bridge and the crew space in the forecastle, while the navigation accommodation is about midships accommodation is about midships The inner bottom is raised and sloped upward in the wings and built into the sides of the vossel forming a suitable incline for gravifating the eargo to the con resinanting the cargo to the conveyers, and also giving the vessel the advantage of being about half loaded when in ballast and bunkers. In the center line is constructed a slope-top fore peak throughout the hold and between tunnel and the tunnel extend ing from the engine space to the raised portions of the double bot of the Robins pattern one on either side of the vessel The sides of the tunnel below the level of the hatchways over the belts are open for free access to the belts and carriers at all times. Over these carriers at all times Over these conveyor belts are placed strong iron guide plates extending the full length of the hold and par-tially covering the belts leaving a 24 inch hatch over a 36-inch belt This space is covered in the holds by cross-laid batch covers, 9 inches in length and 3 inches in thick ness, which support the cargo and leave the conveyers to work with out carrying the load At the after end of the hold a portion of the hatch, over which the 9-inch hatch er is omitted is covered by a ntal fron slide door opera by a ratchet in the tunnel On the ide of the bulkhead is con structed an access chamber in free communication with the tunnel which is of such a form as par-tially to protect the slide door from the cargo when loading, and in the floor of this projection of the chamber is fitted a flap hatch to give access to the hold from the tunnel At the after end of the cargo space the conveyers rise from the horizontal and pass up-ward in iron chambers through the machinery space, and thonce into the conveyer-driving engine room shoots in the stern of the vessel These carry the load on to return belts, which are extended forward beits, which are extended royward both sides on the deck in a sim-ple form these conveyers would terminate at the fore end of the machinery space, or poop front and the load would be delivered and the load would be delivered into side shoots which telescope and are adjustable for loading barges on either side of the vessel, the shoots being suspended from derricks or other suitable means. defricas or other suitable means, in cases where the discharge is required at a higher level than is attained at the poop front and a large range of elevation is necessary, as for instance, for delivery

on high quaye into trucks and into barges alongside, the conveyors are carried forward and hinged at the poop front, and the delivery end is sus-ponded by suitable tackle from twin masks or framework, and is raised or lowered according to circum-stances, delivering the load into telescopic abouts sus-pended therefrom When the delivery is into trucks, the "offside" beit delivers amidships into a cross cost veyor suspended on the masts, which carries the load to the shore side and delivers by shoots into the tracks. A development of this principle has, however, been

applied to the steamship "Pallion," as, in order to obviate the use of delivery shoots, which results in considerable damage, the terminal conveyors are carried in swivel booms, which are raised or lowered and swung overboard to the points of delivery, thus perswung overcoard to the points of celevery, thus per-mitting of the cargo being conveyed direct to the truck or barge without shoots. These booms may also be awang across to the reverse side of the vessel, so that both booms can deliver simultaneously into trucks or an deliver simultaneously into trucks or
Another important feature of this dis-

View of the hold



The roal is taken from the bottom of the bold and discharged at an elevation of 40 feet above the water by conveying and elevating botts operated on the ship. Rate of unloading 200 tone per hour, cost two contra a ten. A NEW TYPE OF SELF-DISCRARGING COALING VESSEL.

charging arrangement lies in the method of delivering the cargo onto the belts from the hold, and anabiting the operator to have full centrel and free ascess at all times to the conveyars and to the fice of the cargo. He may thus superistend and direct the continuous flow, and be in a position promptly to correct any tend-estery of the cargo to bridge or to shelp, the aperture seeding to the belt, which, being the samplest space the load has to pass through, insures a ophitmores and un-interrupted collivery.

The unloading of a carge of coal is carried on as follows Presumably the holds are full and the carge lying solid, except under the overhang of the chamber on the bulkhead over the slide door, at which point the space is naturally only partially filled. The slide door in the covers over the conveyers

The side door in the covers over the conveyers is drawn back by the operator in the tunnel, and the loose coal over if immediately travels on to the convers, which may or may not have been started. If running, then the flow continues; if standing, no different culty articles because the conveyer is only filled at that point, and the sperture becomes blocked and only clears and flow when the belt is started. Then, if no "bridging" or continues the started. Then, if no "bridging" or continues the started of the bold is rapidly and the part of the bold in which is carrying it one which is carrying it one dock and which is carrying it on deck and into the receiving trucks or barges. if, however, any "bridging" is threatened, the operator in the tun-nel ascends to the chamber, and nel ascends to the chamber, and has free access over the aperture to correct any block If "bridging" occurs higher in the hold, then he breaks it by means of a pinch bar through perforations in the chamber sides. When the after end of the cargo has run to its natural angle of repose, the operator now in the hold merely removes the first cover and places it aft of the aperture allowing another portion of cargo to run, he being in a free position to maintain the run and correct any tendency to bridging and to abnormal rushes. If such do occur and incline to block the aperture, he again corrects this and, having run so much more, he removes the next segment of cover, and so on, gradually transferring the aperture from the after end to the fore end of the hold. The wing tanks and central tunnel being sloped, the cargo gravitates to the aperture, and the finals are manipulated by the operator, one man being on each side of the hold. An important fea-ture is the inclined shoot, over which all the cargo passes on to the belt. This shoot is carried on travelers on the guide plate sid and is moved by the operator in the hold forward from stop to stop to correspond with the movement of the aperture thus allowing two men to manipulate a whole cargo at the to manipulate a whole cargo at our rate of 500 tons per hour. It is estimated that in regular working the ateamship "Pallion" will be un loaded in six hours, or allowing for stoppages in moving barges, etc., seven to eight hours, and this too with but one stoker, one engineer rs in the hold, and two adjusting the shoots or booms into the craft The total cost of dis-charging the cargo of the "Pallion" charging the cargo of the "Patrion" will not exceed \$60, including the upkeep of the gear, and it is at-firmed that the cost of discharging a similar cargo at, for instan port of Hamburg, is about \$560, and that in the work no fewer than 110 men are employed for about eleven hours under favorable condi-

> is independent of shore labor, and so may avoid the frequent delays arising from labor troubles. The

arriving from labor troubles. The number of more required is so small, and the time occupied so short, that they receive a fastigut matter to agree with the crew of the vessel that they receive a fast entire to gar, and the discharge of the catro become part of their ordinary duty. A library series of the cost of discharge, under such conditions, would not reach the sum of two coasts pee long, and at this cost the carro is also weighted.

Roof Paint.—Mrs 25 parts of powdered only disks, 30 of powdered mice state, 36 of powdered American reals, with half the quantity of pure can't ar und bolt white an easily briefships mayor ft, 00057616.

# NOVEL ELECTRICAL APPLIANCES

### BY PERCY COLLINS

The largely increased use of electricity for illuminating distilleries, wine-cellars, etc., has rendered obselse many appliances which were formerly in use-especially those which consume coal-gas when in operation. Hence areas a demand for up-to-date inventions designed to meet the conditions imposed by progress. Few recent patients illustrate more stributely the manner in which the ingenuity of manhitude was near with the artimotics of motors track on the conditions. keeps pace with the exigencies of modern trade than those which are illustrated in the accompanying photo graphs. The patentee and manufacturer of these original electrical appliances is Mr Frederic Hughes original electrical appliances is Mr Frederic Ruighes, of London, England, and it is to this gentleman that the present writer is indebted for permission to describe and illustrate the apparatus in question. In the case of the electric search-light or coliar-tord, Mr Ruighes claims that the appliance stands alone, being the only perfect, clean, oddriess and reliable invention for theoroughly examining brewers' casts,

vais, refrigerators, spirit or oil jars, cic-The main details of the cellar-torch may be sp-The main evenus or the countrier may be appreciated by reference to the accompanying photographs. The reader will see that it consists essentially of a powerful electric glow lamp of peculiar design, supported at the end of a suitably curved rod sign, supported at the end of a suitably curved rod The circumference of this lamp is so small that the appliance can be used effectually through any orifice not less than half an inch in diameter

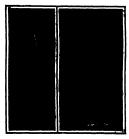
The advantages of this new cellar-torch will be most dily perceived if we compare it with the elder distances which it has superseded. The contact of a gas jet, or a taper flame, with a cold surface (suc as the inner wall of a cask or jar) immediately pr duces a deposit of soot, which may be too slight to attract the notice of the searcher, but will neverattract the notice of the searcher, but will never-heless dissolor and injure to a greater or less ex-tent the fluid with which the vessel is ultimately illied Similarly, when gas is used to "ness" casts, the products of combustion combined with the CO, astready in the cast and the puspent door involved conosal the mustlesses and thus deceive the ex-aminer, who accordingly certifies as clean a vessel which, as a fact, is far from being so With the production of the combination of the combination may partners and the contract of the combination may partners and the contract of the combination may

patent searchlight or cellar-torch the examination may be prolonged indefinitely without in the least affect-ing the actual odor of the vessels interior. As the heat generated by the lamp of this collar-torch is very slight, the appliance may be employed for the examination of vessels containing all kinds of inflammable fluids or gases without the smallest risk of explosion. Each torch may be fitted at will with an oblong or circular mirror, which is screwed to the extremity of the appliance beyond the lamp being passed into the far or cask, a slight pressure against the side or bottom of the vessel causes the mirror to assume a horizontal position, and by this means a view of the under surface of the vessel is readily obtained The advantages of this device will be at once apparent to the practical reader, who will readily perceive that by no other means can the whole wall of a closed vessel be so thoroughly ex-indeed, for the thorough examination of the plored indeed, for the thorough examination of the interiors of bung staves, bushes, boiler tubes, etc., there is no more perfect appliance obtainable than Hugher's cellar-torch fitted with a reflector of suit-

In cont unction with his patent electric torch, Mr In conjunction with his patent electric torch, Mr highes has recently introduced another novelty in the thermo-ore or wax-meiter. This is an ingenious appliance by means of which a perfectly continued supply of meited seating- or bottling-wax may be ob-tained. Like all the most important patents, the apparatus is simple in design and effective in use. When connected by means of the flexible wire with the source of electrical current it is held in the lott hand—the right hand being por-

fectly free for use A stick of wax is fitted into the holder and held in place by means of a serve clip. The left thumb (overcoming a spring) presses the wax downward against the heating receptacle, and by slightly inclining this the melid wax flows through a lip on to the letter, bottle, or other object which is to be seaded Of cooring, as the wax melts, the stick shortens, and to complete the melting of the entire stick a slight mornement of the hand downward on the landle enables the thumb turther to prese the wax multi the whole stick is consumpt—the wax helder travaling in a rew clip. The left thumb (overcoming a

none it becom Whenever it becomes destrable to check the flow of mainted wax, the pressure of the thumb is relaxed, when the apring causes the wax to risis just estileately to the it from the heating late. A flew of the advantages of the thermodiff and be summerated. In the flowt piace, the which is a summerated. appliance may be used in the most confined space, and in any circumstances, with absolute anciety from the fire risk which is so constant a danger where naked gas jets and flexible rubber tubes are employed. Again, the greatest possible economy in the use of wax is obtainable, there being no positive the contract of bility of waste through carelessness, for the reason that melting is automatically stopped the instant that



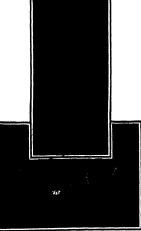
Wax melter in use, scaling bottle cork.

melter.

the appliance leaves the hand No discoloration or smoking of the wax is possible, and the most delicately inted scaling-wax will remain perfectly true to the original shade Finally, the sesting can proceed continuously, and in any position, the appliance needing no proliminary properation, while all splands or cropping of the wax position, the appliance are considered to the control of the scaling let term, postal packets, etc. while articles of value may be nafer left in close proximitive without the slightbe safely left in close proximity without the slight-est risk of their catching fire

The New Agricultural Portilizer The manufacture of fertilizors is one of the most important of chemical industries, but this manufac-

ture together with the exploitation of the nitrate The flexible electric cellur-torch



Colleg-torch heads, showing lamp and mirror (delashed). HOVEL BLECTRICAL APPLIANCES.

beits of Chile and the potash deposits of Stassfurt, is now in a critical stage of development, owing to the increasing production of nitrogeneous fertilisers by the fixation of atmospheric mitrogen, and also to the resuits of recent experiments on the fertilizing effect of extremely minute quantities of totally new agents. The properties of both classes of these new fertilizers are briefly described by René Vallier in Revue de

Chimie pure et appliqueé.

I RITHOGENOUS PERTILIERES OSTAINED FROM TER

ATMOSPHERE

Nitrates Neutral nitrate of lime, containing 13 Misrates Neutral nitrate of lime, containing 13 per cent of nitrogen, has been manufactured at Notodden, Norway since 1905 It is an excellent fertilizer and equal in all respects to Chile nitrate it can be mixed with superphosphate without causing appreciss of nitrogen or retrogradation of ph acid its hygrometric character makes its applica tion somewhat inconvenient, but it possesses, in con-trast with Chile nitrate, the advantage of adding to the soil lime, an indispensable plant food, instead of sods, the accumulation of which may be injurious to

It appears probable that Chile saltpeter will, be it appears processe that Cale sattpeter will, no-fore long, be supplanted by nitrates obtained from at-mospheric nitrogen. The Birkeland Eyds and other processes now in use are commercially practicable in their present form, only where water power is cheap, but these processes are susceptible of great improve ment An efficiency equal to that of most other processes of industrial chemistry would make it co mercially feasible to produce nitrates everywhere At present the nitric acid obtained from the air is neutralived with lime while most of the world's produc on of sulphuric acid is employed in the man of superphosphates. If this nitric acid could be used to convert the tribusic calcium phosphate into the superphosphate an enormous saving could be effected superphosphate an enormous saving could be effected and a fertilizer produced which would contain both soluble phosphoric acid and nitrogen in a form suit-able for assimilation, and would drive every other nitrogenous or phosphated fertilizer out of the market

The difficulty of applying the light cyanamide powder has been overcome by adding a little water, which combines with the quicklime of the crude cyanamide and forms a coarse powder called granulated cyanamide which is much more con-venient in use. A still better form is oil cyanamide, made by mixing the fine powder with 4 per cent of crude petroleum. The proportion of nitrogen in com-mercial cyanamide has been increased by improvemonts in manufacture from 15 per cent to about per cent, that of pure calcium syanamide being about 35 per cent Cyanamide has now fairly entered into agricultural practice The trust which controls the sale of the product in Germany and Italy sold 3,000 tons of cyanamide in the first half of last year

Calcium cyanamide (CN,Ca), treated with water and carbon dioxide yields dicyanamide (CoN,H.) in the form of nearly insoluble colorless crystals, which contain 66 per cent of nitrogen and form the richest nitrogenous fertilizer ever produced. In some cases the cost of production of dicyanamide may be counterbalanced by the economy in transportation Applied to wheat in the quantity of 30 or 40 pounds per it has produced excellent results

Guillin has proved that more than one-fifth of the nitrogen of symamide is converted into ammonia in one week and more than one-third in two weeks, by the action of soil moisture Muentz and Nottin ob-served in two months a production of nitric acid corresponding to 11/12 of the nitrogen of the cyans

mide added to the soli

The poisonous action on plants which was at first attributed to cyanamide fertilizers appears to have no existence or to be due to impurities. The germinating power of wheat treated with pure cyanamide or dicyanamide is not diminished but is sometimes increased Muentz and Nottin h ever, observed a temporary arrest of growth after the application of cyanamide in hot dry weather, and therefore advise the selection of a wet period for its application

IN THE APPLICATION

11 PRITTIPERS CONTAINING MANGATESF
Manganese is widely distributed in nature and
plays an important part in the formation of the
diastases which are the principal agents in vogedisatisses which are the principal agents in vegi-rable synthesis Nagaoka, in Japan applied man-ganese sulphate to rice plantations in quantities equivalent to from 16 to 50 pounds of Mb, Gs pei acre, and obtained increases of crop of from 2 to 37 per cent. The banadical effect persisted to a smallest extent, through the following year Manganese chloride, a waste product of the chlorine industry, exerts a similar action.

In Europe, Voelcker and others have obtained in-In Europe, Vocicer and others have obtained in-creases in the crop of wheat up to 20 per cent from the application of from 25 to 50 pounds of managases sulphate per are Excessive doscs (100 pounds) dim-lnished the crop Similar results were obtained with cade

Grégorie, Hendrick and Corpiaux observed little benefit from the application of manganese to suga beets, but Gasola obtained increments of 46 per cent in roots and 26 per cent in sugar from mange chloride and of 24 per cent in roots and 65 per cent in sugar from manganese sulphate—the chloride diminishing and the sulphate increasing the richness of the fuke

With flux (invols obtained the surprising increase 64 per cent in totally dry weight from manus chloride, and 31 per cent from manganese sulphate concludes from his analyses that the mange inpulsed is assimilated by the plants and that the dif-ference in molecular weight of the chloride and sul-phate determines the degree of influence on the formation of disstances

But the effect cannot be wholly due to the man ganese which is assimilated, for Bortrand found no more manganese in out plants, the growth of which had been increased by manganese, than in the co trol plants to which no manganese had been applied And recent American experiments have proved that pertilizing agents act partly by destroying the toxing left in the soil by the preceding crops. Unstable man gamese saits might be expected to promote the exida tion of these toxins. Manganese exide, traces of which occur in most soils, is entirely inert. The greatest proportion of successes has been obtained with manganese sulphate.

#### UI STIMULANTS AND POISONS

American experimenters have revived the old theory of De Candolle, and proved that infertility may be due to poisonous excretions. It is conceivable that minute doses of powerful poisons might destroy

that minute doses of powerful poisons night destroy these excretions or prevent their formation Cupper Saits The saits of copper have long been employed for the purpose of desiroying fungous para-sites of the grape, and fields of young grain can be freed of certain noxious weeds without injuring the grain plants by spraying with a 5 per cent solution pper sulphate Quite recently Breal has in d the yield of maize by from 27 to 86 per cent by scaking the seed corn in a copper bath and then drying it before planting. The bath was composed of 3 parts by weight of copper sulphate, 30 parts of starch and 1,000 parts of water

Eine Javillier, inferring, from the presence of sine my plants that this metal must perform son function in vegetable physiciasy made an extrasive os of experiments which proved that infinite quantities of zine promote the growth and multiplica tion of mold and yeast fung and some chlorophyl-bearing plants. For example the growth of a certain d was stimulated by cultivation in a medium con mold was stimulated by cultivation to success.

Inthing 1 part of zinc in 50,000 000, the maximum increase was produced by proportion between 1 in 10,000,000 and in 12 5000 and still stronger solutions executed an unfavorable or toxic influence. Micheela d an unfavorable or toxic influence and De Heen find that zinc salts promote the germina

Also: The large proportion of alumina found in the ash of criain exotic plants (more than 50 per cent in the Australian irve Orlies cavelsee) led Yamano to try the effect of aluminous fortilisers on alum, added in the proportion of 1/5 per cent to the water in which young barley plants were growing quickly killed the plants, but proved much less injurious to barley growing in the ground A distinct fertilizing effect, manifested by increase of crop was observed to follow the application of 1/20 per cent and 1/500 per cent solutions of ammonia alum to barley and flax the effect of the ammonia having been carefully eliminated

Magnesia. The presence of magnesia in all plants

and in all soils long ago suggested the employment of magnesia as a fertilizer Tribut's recent study of arose proves that magnesia can act as a ferme Magnesian fertilizers were formerly employed, to some extent and with good results. In recent experiments magnesia has been found to increase the crop of grain potatoes and boets chiefly by promoting the assimilation of nitrogen

asaministon of nitrogen

Brownine Aso finds sodium bromide stimulating la
very aunali doses and poisonous in larger doses to
beans growing in pote One part of bromide to 80
million 5 million and 1 million parts of earth produced increases of crop of 93, 48 and 29 per cent, respectively

lodine and Fluorine Potamium lodide, applied in dilute solution, appears also to act as a stimulant or a poison according to the dose. Aso and Susuki obtained a large increase in crop of rice from about 140 pound of the sait per acre but very little increase from 14 paged while Hollrung diminished the crop of sugar beets by ope-fourth by applying about 4 10

pound per sore. Analogous results were obtained by the same experimenters, with sodium fluoride, applied

to the same crops.

Rare Elements Cerium, like manganese, app act as a ferment Ass finds thorium rather injurious than beneficial to regetation Nakamura has increased the yield of rice, growing in pote, by 70 per cent, by mixing with the soil 1100000 of its weight of lithium carbonate, but a dose 10 times greater produced a crease (55 per cent), caesium carbonate, in the same doses, produced increases of 1314 and 9 per

#### IV BACTERIAL VERTILIZERS

The discovery of the mechanism of nitrification and the fixation of atmospheric nitrogen by the bacteria of root nodules, soon led to attempts to aid the process by the addition of nitrogen-fixing bacteria. In 1895
Nobbe and Hillner patented a process of inoculating peas and beans and the soil in which they grow by seaking the seed with an infusion of a gelatin culture of the bacteria of the root nodules. Bayer offered a pure culture of Ellenbach's bacillus, mixed with potato meal, but Macrker soon concluded, from the contra dictory results obtained, that the preparation had failed to prove its value In 1904 the United States Bureau of Agriculture distributed 12,000 boxes of bacterial cultures, which appear to have produced good results, in the majority of cases

But the effect of these preparations is uncertain, as ne abrupt change of medium may avert the development of the bacteria. The soil naturally swarms with nitrifying bacteria, but their growth may be checked by various causes which will have the same effect the few millions that are added

Stocklass has endeavored to obtain hardier varieties cultivating the bacteria in a large mass of earth. and has obtained remarkable results, but in view of the uncertainty mentioned above, it is prudent to defer judgment until several more years of experi-

THE VALUE AND THE PUTURE OF THE NEW PERTILIPERS The value of the nitrogenous fortilizers obtained by artificial methods has been abundantly and decisively proved, but the same statement cannot be made in regard to the other new fertilizers every one of which has given contradictory results in the hands of differ at experimenters Similar uncertainties, however, attended the earn experiments with other themical mittilizers the value of which is now universally recognized. We have learned how to use nutrient certifizers and we shall learn how to use stimulants. And this knowledge will be productive of incalculable benefit to agriculture

#### Charcot and the Antarctic.

Lest anyone should suppose that Dr Charcot went to the Antarctic largely for the purpose of reaching the pole it may be said at the outset that his chief object was one of scientific research only. He only object was one of scientific research only He only He only resched lattitude 70 degrees, and therefore can hardly compare in achievement with his professessors, and colably with Shakishion and Sectio. What he did was to expiore a region of archipolagoes and vaterways, or which very little is known, and to broaden our knowledge of an ice barrier which extrade westward from the South Sheitand lisheds subroades. Although Dr Charcot returns with now of the larmin of Sheitandies of the companion will increase of Sheitandies when the supportations will increase of Sheitandies of the supportations will

laurais of Shackieton and Scott, his explorations will be of much assistance to foture hatarctic explorers From the meager account of his findings it would seem that any attempt to approach the pole by way of the strate of the Scott Shekland Islands is doomed to failure, and that Commander Fearry sind of the tacking the pole is a direction opposite to that puraued by Shackieton is hopeless. So far the only starting point that holds out any promise at ail is the starting point that holds out any promise at all is the base of Ross's ice barrier, where the volcanoes Erebus and Terror are to be found Here and here only can an expedition whose well made the control of the an expedition winter not more than a few hundred miles from the pole

#### The Current Supple

The current Suppressent, No 1782, contains some very striking illustrations of the Paris flood, which show to what extent the capital of France has suf-fered from the inundation. Mr H F Stimpson contributes an excellent article on efficiency in shop opera-tions, in which he shows how shop efficiency can be reased, as well as some results secured by the methods which he advocates. Mr Claude Grahamsen, while, in an article "Some Emperiences of an Ariator," sketches his own experience, and thus shown many an aspiring aviator what he has to avoid. Another paper on explosives for use in cost mines by Munroe and tillul a presented. The second and coscieding installinesty of the article on the Wright its particles, containing extracts from the court's option and the briefs is published Br F Dablet concludes the symbol of the property of the court of the symbol objects of the sy he pays a tribute to that great man's engineering abil-ity When the Nebel Prize was awarded to Mr. Marconi, he read a paper at Stockhoku, in which he sum-marked the recent development of wireless talegraphy. That paper is published in the current Supprensience.

#### An Injunction Agels

Judge Hand, in an opinion filed in the United States Circuit Court, granted the injunction pendente Me saked for by the Wright Company against Louis Paul-han, the French aviator, alleged to be using in his sahibition flights here a machine which is an infringement of the patents granted to Orville and Wilbur Wright. This decision prohibits Mr Paulhan from Wright. This decision prohibits Mr Paulhan from using his machine in this country pending the trial of the Wrights' suit against him.

After discussing the prior discoveries cited by the

defense, Judge Hand in conclusion cays

erenne, Jugge Hand in conclusion says
"It is, of course, unusual to grant a preliminary injunction before any adjudication and without any
sculisseence However, when the right is not seriously attacked, and when the infringement is clear,

the court should not hesitate to interfere
"From the showing made I cannot doubt that the
complainants first put into any practical form the system of three-rudder control. That there may be other systems is not the point, let the defendant use those if he will Nor is it necessary to conclude that the complainants were the first to fly Upon that I decide nothing whatever, for it is not an issue in the case.

"All I do say is that I cannot find that anyone prior

to their patent had flown with the patented system, and that the changes from the specifications which the defendant had made are no more than equivalents which do not relieve from infringement.

"It is quite clear that for the complainants' protection a writ must go pendonte lite, because the defend ant, being a non resident, who is here transiently, there is no way in which they may insure themselves of the monopoly they have acquired except by prevent ing his use of it at once"

#### A Library in the Sahara.

The French Colonel Gaden, who recently led az ion into the southwestern region of the Sahara, found in the course of his investigation that one of the most powerful princes there, the Sheik Sidis, was the most powerful planess tore, the Snick State, was the founder and possessor of a rather large library, a report of which is published in the latest number of the Revue du Monde Musulman This library is small, indeed, when measured by our ideas of such a founda-tion, for it contains only 683 books and 612 manution, for it contains only 833 books and 612 manu-scripts Still it not only preves that a most urgant need of books has seized the most distant outpost of Mohammedan cultivation, but also provokes most lively interest in consequence of its composition

Approximately the books comprise thirty groups re-lating especially to koranic crudition the dectrine of iating especially to Koranic crudition the doctrine of faith, history, jurisprudence philology, travel and dis-covery, poetry and fiction, married life, magic recipes, interpretation of dreams and astrology. The library, therefore, bears the impress of sheer orthodoxy, which is further manifested by its lack of books from for-bidden provinces, such as philosophy and the natural sciences, but already the existence of printed books, on of which is deemed a rigorous contra diction of the strict tenor of the Koran, proves that relution in the production of books, which b in Stamboul toward the end of the eighteenth century. has to-day acquired citizenship in the whole Islamit world, and that at no remote day also in this circle of world, and that at no remote day also in bits circle or culture and of passionate political aspiration and archivement the printed book will force the written book into a very dim background Islam, long ob-structed by crass ignorance of many foreign things among them books especially which could have exer-cised a most beneficial influence on its daily life, is built discussed by the frequent book in its own longues. which comes galloping from European publishers eve into the precincts of its haughtiest orthodoxy Tp printed book is already an irresistible leaven in Islam

#### Booth of Altred to

Alfred Spear of Passaic, N J., died at his home in his 87th year He was one of the first who over con-ceived the idea of a moring sidewalk. His model in-terested such men as Peter Cooper, Horace Grealey, and several other prominent men The scheme had h to commend it that two Legislatures, the of 1873 and 1874, authorised the use of his sidewalk but the Governor of the State vetoed the bills.

#### Hiveren of the Telephone The Ser

Proces has calculated that an andible sound is produced in a telephone by a current of 6 by 10.2 amperes, and Pellat has calculated that a sound is produced by a difference of potential between the two sta-tions, amounting to only 1-2000 voit. These statements tions, amounting to only 1-most work. These statements give some idea of the great sensitiveness of the most are telephone, but the sensitiveness of the human or, which perceives the invisible villegibles of the telephone displaragm, is no loss rectarification.

#### Correspondence.

## NOW A TROLLEY GAR REVERSED ITS POSITION.

To the Editor of the Scurrytto America On January 80th, 1910, about 13.40 P M, a curious and unique socident happened in regard to limited our No 130, D. and F, at the crossing of Main and ash Streets, Piqua, Ohle. The phenomenon was so remarkable that I have concluded to make this report of it, and if you see fit you may lay it before your

The car was headed south on Main Street, runni The car was neaced soun on sain street, running perhaps ton or twaite miles per hour At the switch in Ash Street, where connection is made with the city line, the rear truck left the main line and followed the Ash Street line, and the car body turned completely end for end, returning almost completely to the main line. Neither truck was at any time of the rails and even the trolley wheel was still in work ing contact with the over-head wire when the car stopped The brake rod connections were all stripped stopped The brake rod connections were all stripped and torn loose, also the wire connections from controllers to motors were severed. No one was seriously injured, and a casual observer coming on the scene, as the writer did, a few minutes after the occurrence would not notice that anything out of the ordinary had transpired

The attached diagram shows five positions assumed by the car in its wonderful evolution. The relative position of the truck with reference to the body and also to the tracks is shown, the end of the normally positioned toward the center of the car body boing indicated by a and b The end of the car headed south before the accident is indicated in each figure

Fig. 1 indicates the status of things when the truck

much experience in the Himalayas and who states to Prof H. C. Parker that the amount to be allowed for refraction on high sow mountains was most uncertain, that therefore the altitude of the great Himalayan peaks, though given in precise figures, was ee in the Himalayas and who stated

Furthermore, I once met a former member of the British Royal Engineers who told me that the triangu fation of the well-known mountain K' recently at tempted by the Duke of the Abruszi, was made by a friend of his, whose allowance for refraction was double what he thought should have been made. With the smaller allowance K\* would be about 4000 feet

the smaller allowance K' would be about 4000 feet higher than it is now regarded. It is therefore obvious that if similar allowance for refraction is made on Huascaria, it may easily hap-pen, especially in a country with a much drier atmo-sphere than India that the nountain is 1,000 reported. So feet higher than has been figured Accordingly while it is perfectly poper for all who desire to do so to accept the figures of the trinaquia tion, regardless of the careful ceitmant of myself and

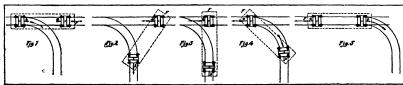
of the Swiss guides and of the evidence of the photo-graphs, no one need feel obliged to accept those figures an Anal

As to Aconcagua being the highest of the Andes. may say that aside from Huascarán there are sever mountains which may prove when carefully measur to be of greater altitude than Aconcagua In this connection it may not be wholly out of pla

to say that while Mrs Fanny Bullock Workman has. according to the newspapers frequently announced h readiness to furnish evidence of the altitudes claimed readiness to lurish evidence of the altitudes claimed by herself, when I wrote to her stating that I should be glad to see the figures of her observations, an in terest shared by some other Alpinists she informed me that they had not been published in any of her The Harriman is a special 4-cylinder motor of 50 horse-power and weighs 300 pounds 1t has copper water jackets and aluminium crank-case. The bore and stroke are 5 inches. The 5-cylinder V type motor her crank-case and cylinders cast of macadamite eviloders are lined with cast fron and the nistons also cylinders are inceeding rade out to an in a pictons also are of a special grade of this metal. The bore and stroke are each 4 inches. The output is 50 horse power at 1,200 revolutions per miaute. The 12-cylinder V-type Buffum motor is constructed similarly to the Easttype summ motor is constructed similarly to the East-on each row of cylinders being cast in one piece with the upper part of the crankcase and afterward being bored and lined with east from This motor is beauti-fully dnished. Its weight complete is but 415 pounds, and an output of 100 horse power is claimed for it at 00 revolutions per minute

Upon entering the large main hall of Mechanics Building the visitor saw upon his right the Bieriot and Antoinette type monoplanes of the Stientific Aeroplane and Airship Company of New York. The former of these machines which is fitted with a 4-cylinder air-cooled 2 cycle motor has lately been experimented with opon ice by Mr Stanley Y Beach and is in a fair way of making a flight in the near future. The Antoinette type monoplane was shown with a huge red 9-foot pro-peller of special design, which has been found to be very efficient design, which has been noting four having two superimposed wheels was also fitted. Opposite these two machines were two Wright type biplanes of Frederick P Schneider. The finished one of these two machines had movable flaps upon the rear edges of the wings instead of the warping arrangement used by the Wrights.

ding onward around the hall, the visitor next saw two new monoplanes—one (the Morock) a small demountable Bleriot type machine having wings laced upon steel tubing and the other (the Burlingame) a



b is about to turn from the main line. Figs. 2, 3, and 4 show intermediate positions, and Fig. 5 the car when E B RAYNER it came to rest

(The mere momentum of the car would not secon I no more momentum or the car would not account for the return of the car to the main line. The fact that the trolley whoel remained on the line suggests that the motorman must have reversed the rear motor, which acted to push the car back in the reversed post tion to the main line.—Ep.]

#### MISS PROK REPLIES TO MRS. WORKHAM To the Editor of the SCIENTIFFIC AMERICAN

Having observed in your issue of February 12th a letter in reference to the altitude of Mount Husscarán and my record from Mrs. Workman, may I state my own position a little more definitely?

After making the ascent of Mount Husscaran, north eak, September 2nd, 1908, of which I brought back absolute proof in the shape of photographs, I gave my reasons for believing the mountain to have an altitude of 24,000 feet although on account of the high wind had been unable to take hypeometric observatio on the summit.

on the summit.

Naturally, I did not expect the scientific world or
anyone cise to regard my estimate as an exact measurement. If anyone did so, I cannot be responsible
It was, of course, quite within the province of any
one to take so great an interest in the matter as to

spend some thousands of dollars in sending engine to Peru to make a triangulation of the mountain, a

to revu to make a triangulation of the mountain, and to publish this as the absolute height of Husacarán.

There is, however, something to be said in regard to the accuracy of such triangulations. Permit me to quote from the recent work of Mr. A. I. Munm (of the English Alpine Club). "Five Months in the

Minutary me.

The results of triangulations do not through agree and even when they precidently coincide, they cannot be accepted as shoulding insupersakable. There is good reason to end on the suppose for the allowatons made for it to be perfectly accurate and higher and more remote the amount, the larger in the higher and more remote the amount, the larger in the suppose of th

Another distinterested authority is Dy. Norman J. silie (also of the English Alpine Club), who has had

writings, nor did she offer to give them to me per-ARNIE H PACE nally

New York, N Y

# The Acronautic Show at Boston

The first exhibition of aeroplanes, balloops, and aeronautic apparatus exclusively to be held in the United States was held in Mechanics Hall Boston, Mass, from the 16th to the 23rd instant. This first Aeronautic Show, although fairly representative of the different exportmenters, was somewhat of a disappointment in that there were no motor-driven heavier than-air ma that there were no monor-driven nearier than air ma-chines exhibited that have actually flown, while 69 per cent of the power machines were shown without mo-tors. This fact however, did not deter one from get-ting a good idea of the design and construction of the lanes proper

The question of reliable light weight mo sonable price is still a burning one, and a fortune awaits the man who will produce such motors-of and 50 horse-power respectively—to supply them to aviators upon easy terms. Eight different makes of motors were on exhibition, three of these (Curtiss, Cameron, and Harriman) being of the 4-cylinder 4 cycle type, two (Waterman and Duryea) of the 4-cylin syle type, two (Waterman and Duryan) of the 4-sylin der, 3-yche type, and two (Bandon Cordage (wonpan) and Bintum) of the 4-cyte, 8-cylinder and 12-yrlinder y type respectively. An Eibridge sylinder and 12-yrlinder y type respectively An Eibridge sylinder water-cooled 3-yrle motor was also shown on the Wright type blass of F P Bchneldor The 5-bornes-power 4-cylin der Duryan motor which was shown upon the Bletch type monoplant of Stanley Y Beach, is alrecolded by means of thin copper stripe wired to the cylinders of the Charleston motor—a4 was a 8-cylinder of 50 and 45 has considered to the cylinders. horse-power respectively—are also air-cooled with the usual cast flanges. The smaller of these two motors and the Duryea motor both weigh about 200 pounds, or approximately 50 pounds more than the Curtiss 25 30 water-cooled motor with radiator and water. The reason for this apparent superiority of the water-cooled motor as regards weight is found in the fart that the moter as regards weight is found in the fart that the Corties is a specially ensurenced acrossatic motor, whereas the air-cooled motors mentioned are simply automabile motors adapted to accrossative use and not lightened nearly as much as it is possible to lighten them. The same may be said of the Ribridge, which is a marine motor. The Waterman, another light in rine motor built for canoes and dorfes, weight in maker 100 pounds complete with flywheel, which can be Atmonged with and develops about 15 horse-nower

large monoplane with trussed inclined struts running from the bottom of the wide central frame to the ends of the wings A 50-horse-power Harriman motor, di-rect-connected to a large and thick propeller, was placed at the front of this monoplane

A biplane that attracted considerable attention was at of Victor Page. This had a rectangular central that of Victor Page. This had a rectangular central body and extremely thick wings with a deep curvature, A novel revolving cylinder 2-cycle motor (the L. A. W) was pivoted in front, so the propeller mounted upon it could be directed upward or downward

The Hayward and Erickson biplanes were construct ed entirely of bamboo In general outline they re-sembled the Curtiss, as did also the Eisner & Downey and the Reaud machines. The Erickson biplane had a Ruick automobile motor weighing 240 pounds fitted, the weight of the biplane alone being but 220 pounds

weight of the hipiane alone being but 220 pounds.
The finest piece of construction on exhibition was
the Herring machine, built by the Starling Burgess
Company, a well known but building concorn of Marbishead, Mass This machine, in general appearance resembling the Curtiss biplane was mounted upon three round skids no wheels being used. The horithree round skide no wheels being used. The bort-sonial rudder was worked by the valutors feet and the vortical rudder by hand. A long inclined rod was placed on each said of the seat, to which the aviator can cling. Springs were introduced in the gars wires, no turnbuckies taing used. The poles that entry the front and rear rudders were all hollow. A Curtisa motor with a 4 banded propoler of Mr. Interlage design was fitted. The machine complete weighted less than 600 pounds. The propeller is said to give 200 pounds. trust, which, it is claimed, is ample to start the ma-chine on any ground on its skids. The stability device for lateral equilibrium was not exhibited

for lateral equilibrium was not arbibited. There were also soveral glids ro not view, and a large number of models of all kinds, most of which were built by boys. The exhibition as a whole was a very creditable one. It leads one to believe that America. will soon catch up to Europe in the aeronautic industry as it did with the automobile

Balloons were also in evidence Among them was he New England Acro Club's balloon in the very mid dle of the hall, inflated almost to its full capacity This balloon has made 45 ascensions and has traveled 1,251 miles Lee Stevens exhibited the basket of his 30-passenger 160 000 cubic foot balloon. A huge hot-30-passenger 160 000 cubic foot balloon A huge hot-air balloon from which a trapeze performer made five parachute drops at Coney Island last summer is also

# THE COCHIN FOREST RAILWAY

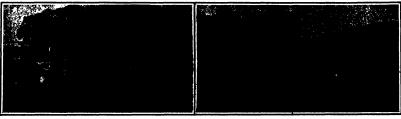
#### BY EDWARD HARRAN

The Cochin Forest Tramway is an interesting little not tramway on the motor gaze in the sent independent State of Cochin in South India It runs alightly to the north of the 10th parallel of latitude and to the cast of the 74th parallel of longitude, and owes its origin to the fact that the forests of Cochin form one of the most valuable assets of the State, their approximate area being 605 square miles, or nearly one-half of its entire extent. Their commercial importance it is stated, was vaught realized as far back as the beginning of last century, but the earlier attempts to work them were of the usual spasmodic and unsystematic nature which characterised original criteria in foresty throughout the Indian peninsals. In the year 18th, over 18th, ov

fact that is land route, provided means of transportion over it were available, would up a far richer forcet area than a proposed river route alone, while, of course, it would be open all the year round. So it came about that the idea of a transway in three so-tiens arose, were recommended to and mancioned by the Durbar The first section was to cover a distance of 8 miles in the valicy, to be followed by a self-acting inclined transway 5,000 feet long. The second section, 4½ miles long, was to be followed by a sittle Apollow of the course of

logs both at the head and foor of the silde preved expensive. To remerly this latter, the occurration of the silde into another self-acting incline was decided upon. To remody the first, Mr Alver Chetty recommended, and the Durber Sammer of Chalakrud, to make the Shorant-Cockin Railway at that station, a consistency, with the sequineceme of the Madras Railway authorities, being made between the railway authorities, being made between the railway and transway there.

To-day the total length of the line as it stands completed at the time of writing is 49% milles divided halo three sections. The first section extends from mile 31, to 21, the second from mile 32, to 17, and the lite from mile 35 to 43%. The first and second sections are connected by a self-sciency wire rope manipolated double way of 15 miles, while the second self-time density connected by another incline a mile in learnth unities in learnth section.



The logging locometive, truck, and cabenee

Stone-and-timber bridge on the line of the Cochin Ferest Railway.



Riephants moving logs for shipment.

A train of timber cars. Note the density of the ferest growth,

State, there was little or no pretense made of administrating the forests on scientific principles, with the more or loss natural result that while the interior of more or loss natural result that while the interior of the state of the transporting the cut timber! remained practically outside the state of the state

Highness the Maharaja of Coobin to the Parambiblosian and Neillamptiv forests in October, 1993, suggested a revision of this scheme which provided for the areasion of the proposed transvey to Parambiblosian, an additional 13½ miles, the experience gained during the preceding year or two barting shows conclusively that the Parambiblosian River could not be relied upon to carry were year anything like a year's full yield to carry were year anything like a year's full yield

of timber A survey of this extension was made by Mr Haldwell, a specially engaged engineer, in 1804 According to the original scheme, the traction of the timber trucks was to have been by manual labor, but when the length of the proposed line amounted to 31 miles, it was recognised that manual labor would prove both too expensive and too laborions, and in Espémber. 1904, lobemotive engines irraction was fassily decided upon The modifications of the original scheme airrady alimded to mocessitated a full reconsideration of other portions of it, chiefy the proposed combined river and read transport whole it was anticipated would not clear the accumulations of timber Also in practical working it was found that a timber slide, especially in the case of bengthy, and howey long, was unsatisfactory, and the handling of Throughout its whole length the Cochin Forest State Railway is excellently constructed. The gage is 1 meter; the average gradient of the line 1 in 50 and the maximum gradient I in 2.5 which gradient ocurs on the third of the five inclines which have been embodded in the construction.

passes over a groored pulley 6 fast diameter, after which it forms a figure 8 over a looss pulley back again over another 6 foot pulley mounted on the same short as the first and thence to the other line On the vertical short on which these two pulleys are, and on which the rope blads are mounted two hort sented 4 cmm pulleys each 6 foot diameter 3% inches broad with 1% inch fanges 8 teel hand brakes 3/16 host blads and 28 technic backes directed with sh thick and 8 inches broad studded with hard od brake blocks 6 inches long can be applied to see drums by powerful linked levers controlled by these frame by powerful linked levers controlled by hand wheels and erway, to control the speed of the lead descreding the incline. The groomed pulsays round which the rope binds are filled in with leather sections on end grain to give a good grip. The cast iron portion of these wheels is suitably downstalled out to contain the leather packing. The first second and fourth of the five inclined ways are on curvers round which curves the wive ropes are guided by vertical rollers. On the straight portions

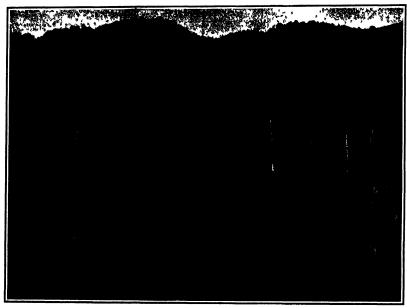
the inclines the cable is supported by horisontal lars placed 30 feet apart Illustrations of one of

sistent examination Frof Moser has yet made. In this cave were found four such layers of clay separ ated by layers of sales. While relies of the new age were found in the first and second layer of ashes in the third and fourth layers were discovered remains of the painters mussel land snalls the bony scales of the swamp-turtle and a mammal fauna such as the otter beaver goat stag and wild bear which manifestly point to the fact that the first cave-dwell manifestir point to the fact that the first exceeded are recorded to the reast vacate districts for their sustance while the later cave-dwellers found a much more generous source of nourtheast along the coast An important fact is the presence in those oldest layer of frequent tools and to the same layers belong the especially interesting art objects engravings on saimal bose described pictorially many of them in the Profusors report. On a polished pitte of sings about the contract of the c

Moser cave and very recently the Professor found a wall preserved human lower javones in the so-called Cave of the Bears' Bandstones marked with grower made by whetling the bone tools on them prove that the cares were also the workshops of the cave-dwell ers. A high degree of development is allowed by the pottery, the vessels formed by a free hand are manifold not only in their form and material but size in the contract of the olor in which are the ears of corn and leaves of paim which ornament the band. This piece aim reminds one of the decoration of Mycensean pottery

## Have Pishes Memory !

Studies as to the mental powers of animals have already been made on several occasions but only recently have inquiries been made as to whether fishes have a memory or not Results have shown traces of a m mory both in coral sooj byt s and other different of the dol Experiments have been made with sev



Part of the main line with empty train on a grase THE COCKIN FOREST BAILWAY

se inclines are here reproduced. The rolling stock of the Cochin Forest Railway consists solely of oper trucks specially designed for carrying limber with swiveled bolsters and chilled cast-fron wheels

#### The Art of the Cove-Bweller.

The Art of the core-Develler.

A very neterority discovery or caves which has brought to light a number of art objects of the oldest inhabitants is reported by Prof. Mose; in a last number of Unachan In a depression which has the appearance of a trought of the valley extending route the Karst (Anstralian) plateau Trisate Nabressian Drian, to the Valait Keuntians are found unmere caves to which leads a gate of rock under the project ing wall of the old? Their interiors are rooms small or spacious, which were first only place of sojourn for the Karst own-dwales who originally nomade inter settled down to habitual residence in them that the contract of the light of of the l

On a second engraved piece of bone a jawbone that was found in the third layer of sahes is pictured with a contour of almost straight lines a wild boar of which the head is almost triangular the tuaks being clearly drawn the eyes and ears being faintly indicated the bristles on its back appearing with per indicated the bristles on its back appearing with per fact distinctions and the curl in list vall being rether indistinct. That the artist of the care sought to re-produce the aspect of nature in which he had often seen and sishn the wild bear is shown by the high gream in which the animal stands and which is repre-sented by strong incisions. On a think hone is restly recognized the head of a not surface with any and desp-recognized the head of a not surface with any and desprecognised the head of a scaturite with aye and dependent most the scales and folds of the skin relationship of the most the scale and the sca

While the layers of ashes contained a generous num ber of finely worked tools of bone and pieces of orna ment, the occurrence of relics of man himself is re-stricted to two streetons with additions from the

eral fishes bit the most siriking results have been obtained with the gray p reh which lives hi fly on a small silvery huck sardine. Some of the work taken and colored red and were then jut into the tank where the perch was with several oth reliver colored sar the perch was with several oils sellice of countries of course it normal one-were at one at tacked and eaten but it was not till hungry fast the victime on recombing the sail to flar in however hap romptly demollah it is mainter a list of any in the specimens in the tank decour it he sardines irrespective of color thus showing not only tra us of a men my but also the lower work of the contribution of the sail of the contribution of the contri sequently sardines colored red and blue were placed in the tank together with the silver on s the came seeme was repeated the blue ones not being atta ked till the others were eaten and hunger compelled in restigation of the new comors. After this introduc-tion the perch ate the mardines of all threetyp a with out any difficulty. Some spines of the sea n. iii (ac tinis) were then fastened to the blue sardines these were at once avoided by the petch who; runtily got out of the way of the new comers. This showed traces of memory as the results of contact with the sea net-tle were clearly shown and recognised.

# THE NEWLY DISCOVERED GOBLIN SHARK OF JAPAN

BY DR L HUSSAKOF

Every now and then the zoological world is startled by the announcement of the discovery in Japane waters of some very rare or very ancient type of animal. So often is this the case that coologists have come to look upon the deep waters of Japan as a sort of naturalists wonder realm- a preserve in which live all manner of interesting animals some of them of an archaic type long extinct in other parts of th The expectation of remarkable discoveries in these waters is so strong that I have heard a distinguished American conferent who is himself well acquainted

Inpunese waters say that he would not be greatly surprised to hear some day that a real Mosasaur or ichthyosaur had been hooked in the depths of Auro Sharo or warm Black Current of Japan

It is in these waters that Japanes fishermen occasionally take on their lines a shark whose grotesqueness has won him among natives the name of Traguzame or goblin shark One of these "goblins" came into the hands of President

David Starr Jordan of Leland Stanford University a quzen years ago and was at once recognized as an interesting archaic type whose close relatives had long since become extinct President Jordan described it under the name of Milsukuring osceloni-the name being given to honor at the same time the late Prof kakkhi Mitsukuri who for a quarter of a century was the leading light of Japanese xoology and Mr Alan Owston, a natural history dealer of Yokohanis, who was instrumental in securing the specimen name, by the way, does not stand at the present day but must be replaced by Reapmorthynchus—a name which had previously been applied to the teeth of the extinct species of this type of shark found in the rocks of the Chalk period, in different parts of the world in accordance with scientific usage therefore, the Japanese shark described by President Jordan

must now be known as #capanorhynchus onstoni

It is now to be recorded that a second species of
gobiln shark has turned up in a most unexpected way It happened thus All of the sharks caught in Japan in the past years and

sent to the various mussums - about twenty in all-were, tooked upon as belonging to the same species, S owstoni No one had ever thought of comparing several specimens, in fact, these sharks are so rare in museums that comparison is generally quite out of the question it was therefore a pleasure for the writer to have of comparing several lections at Columbia University and the American Museum of Natural History and to find among them s new species of the goblin shark This has recently been de scribed in the Bulletin of the American Museum of Natural History as Respon-rhynchus fordant—the вресійс name being

ven in honor of President Jordan, our greatest au thority on the fish of Japan

w to come to the fish himself illustration (Fig. 1) the new shark is certainly grotesque, well deserving his sobriquet 'gobliu' The largest specimen in this country is one in the National oum at Washington measuring over cleven feet, the species probably attains a length of fifteen Fortunately it is not given to frequenting the hathing-beach, but keeps to deeper waters—usually about fifty fathoms. As is generally the case with fish from deer er water, this shark is soft and pliable. Even after bardening in a preservative for several months, it can be relied into a bail. The most remarkable feat ure is the curiously elongated "nose" (shown in Fig. 2) It is this together with its protruding jaw and amail bendy eyes, that gives the shark that univ

appearance. The teeth (Fig 3) are sharp and slender, each like the pointed end of an awl. They constitute a most effective weapon, which must be fingered. with discretion even on the laboratory table the peculiar anatomical characters, suffice it to say that in the total make-up it is so different from all other sharks that President Jordan was at first inclined to classify the genus to which it belongs in a special family by itself

As to the differences between the new species and the one already known, we need say only a few words



The pictures show the differences at a glance even to the layman in matters ichthyological (lower picture) is distinguished by a much less pro-truding jaw, by a very much smaller spiracle (the minute accessory gill pore seen at some distance back of the eye), and by the fact that the eye is situated opposite the middle of the jaw instead of back of it These features are quite sufficient, in the opinion of experts, for separating our goblin as a distinct "kind To the general reader they may perhaps be of inter as examples of the degrees of difference which are un e which are used by specialists to distinguish species of fish

Pipe, Cignrelle, and Cignr.

The question as to which of the three forms of smoking, the pipe the elgarette, or the cigar, introduces the greatest proportion of alcotine into unoker's system has never obtained a combletely de er, although it has received consid discussion from time to time aAt one time it was freely asserted that the tobacca which contained the

ter of fact, carbon monoxide is invariably found in all tobacco smoke, and that circumstance should be suf-ficient to warn all smokers against inhaling it per ould be sufficient to warn all smokers against inhaling it per-sistently Theories as to what happens in the com-bustion of tobacco in the various ways it is smoked next took into account the extent to which condensa-tion products were formed and retained in the to-The most effective condensor, of course, is the pipe, and there can be little doubt that owing to length of the stem a comparatively small proportion these condensati on products reaches the n In the cigar, on the contrary, the

densing process has a ter to travel throughout the cigar, at all events, as the cigar gets shorter the condensed product area gradually reaches the mouth and ally the products are conveyed there by the heat of the burning end it has been said by connoisseurs that no cigar is worth smoking after one-half of it has been consumed which seems to be a practical realization of theoreti-

cal considerations very suitable for application by millionaires Again, a cigar that has been partially smoked and then allowed to go out is decidedly unpleasant when re-lit, owing doubtless to the spread of condensation products to the mouth and. In the or consensation product to the mouth care. In case of the pipe, the burning area is always in the same place, if never comes near the mouth, and therefore the probability is that the condensation products do not reach the mouth in, at any rate, appreciable quantities in the cigarette the condensation products eventually reach the mouth, but there is in this case less chance of condensation products forming since the combustion is unhampered, the tobacco being freely in contact with the air The ques tion of maisture, however, must not be left out in these considerations, for it is obvious that damp tobacco will form condensation products more readily than dry tobacco. It is probable, therefore, that a dry cigarette gives off less poisonous produ than a damp one does, but not everyone smokes from choice a new cigar or an old cigarette It is reason-able to conclude that

the amount of nico-tine reaching the mouth does not necessarily depend on the amount in the tohe but on the form in which it is sm In drawing this conclusion regard must, of course, be had to the quantity of to-bacco smoked, but if the conclusion is correct, the pipe would come first as the least harmful form of tothe cigarette, and lastly the cigar—Lancet.

It has often been remarked that the centers of sciemic and volcanic activity move slowly westward in a recent issue of the Physikalische Zeit-schrift, H Wehner adopts this belief and endeavors to explain ment by reviving the

old hypothesis of a solid nucleus, separated by a thin stratum of liquid soun muceus sources of a time structure or ignored from the earth's crust, and rotating slightly less rapidly than the latter According to Webner's calculations, the nucleus makes a complete revolution, relatively to the surface of the earth, in 862 years. (There is room or a good deal of uncertainty in such calculations,) Webner supposes, further, that the nucleus is studded wenner supposes, intrast, tast the nucleus is stuaded with protuberances which are centers of activity and that these protuberances, coming into comtact with weak parts of the earth's crust, cause earthquakes and rolcanic cruptions. From this theory and the records volcanic cruptions. From this theory and the records of earthquake shocks observed by navigators of the Atlantic Ocean diaring the last sixty years. Webner con-cludes that a group of these dramitable protherences has now arrived under the region between 1 bigs. Na and 1 deg 81 institutes and 87 and 48 deg. W. hongitisels, and that danger is tumbient in these part of the, world.

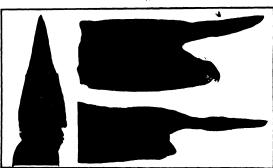


Fig. 2.—Heads of two species of gobils shark The lower one is that of the newly discovered Jordan's gebils shark (Sespanorhyachus jordani). --- Under side of boad of Jordan's goblin shark.

THE NEWLY DISCOVERED GOBLIS SHARK OF JAPAN.

highest amount of nicotine necessarily tended to be the most injurious, no matter in what form it was smoked, but we now know that the form of smoking plays an important part. There was a theory that not in all three cases was the original nicotine in the tobacco conveyed as such to the mouth, sometimes it was destroyed by effective combustion, while at other times pyridine was responsible for toxic effects. According to this theory which was all on the right track the cigarette was least harmful, because the tobacco along the thin paper wrapper was expe eely to the air and as a consequence the tobacco was stell burst and all nicotine was destroyed Against stell burst and all nicotine was destroyed Against this it was hold that in such a case one poince disep-pared only for another one to be elaborated, and arbon monostile was found in marked quantity as a poisonous constituent of cigarette smoke. As a mai-



#### FIREPROOF ABOR.

Pictured in the accompanying ongraving is an arch used more particularly in firsproof work, which is of very simple construction. It consists of but two tile sections, each provided with an air space usually designated as a "vacuum." The usual I-beams be-

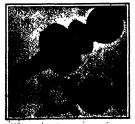


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tween which the arch is formed are indicated at A and B. Back anch member comprises a top past A, a bottom panel D and a side panel E thus giving the member the general shape of a wedge. At the point of the wedge one of the members is provided with a tompet P, while the other members is provided with a tompet P, while the other members is provided with a tompet P, while the other members with the state of the produces are fitted between the I is amist they are thus retrieved and B To resist this thrust the beam and B To resist this thrust the beam are braced by means of cross rook, as indicated by produces an outward spreading thrust against the team are braced by means of cross rook, as indicated by part of the upper panel of no of the sections howen away to reveal the reinforcing which, in this case, consists of a notting of heavy from or steel wire in bedded within the material. The lower panel is braced by means of brar B dimbedded therein which exicate up into the tongue P. They take the each threat the vaccious of own which we can be a supplied to tween the panels serve to prevent undue travel of heat through the arch in case of fire A building having a large proportion of such arches is therefore to that arch is attent rendered more marry frouppoof than would otherwise be the case. The inventor of this arch is a larged to proportion. The Timestria, or 150 Withers Birest, Rookhyan, Y? Pitcapatria, O. 150 Withers Birest, Rookhyan, Y? Pitcapatria, O. 150 Withers Birest, Rookhyan, Y?

#### MUFFLER FOR TELEPHONE TRANSMITTERS.

Unless one is using the telephone in a booth or in a quiet room it is impossible for him to sectiode all coal disturbing noises by stopping the ear that is not applied to the receiver, for the reason hat the not applied to the receiver, for the reason hat the coal interest of the receiver in the receiver in the coal interest of the receiver in the coal interest of the receiver in the coal interest of the receiver in the receiv



MUTTERS TOR THEOREMS TRADUCTURES.

to the outwardly farlag form of the transmitter the device is thus firmly made fast. Between the vingalaped plate and the transmitter is a strip of felt which serves to prevent vibrations that strike the plate from being communicated to the monthplets of the transmitter. The second member, which is hinged to the transmitter and the second member, which is hinged to the transmitter that the second member, which is hinged to the transmitter. The strip of the transmitter is closed down upon the other member it will exclude all sound from the transmitter. The hinged core is provided with a flager place, by which it may be opened whenever one desire to use the transmitter but at all other times it should be closed to exclude local noises. The inventor of this simple statement for telephone transmitters is William D Plumb, 2022 Latington Arwayo, New York (Latington Arwayo), Latington Arwayo, New York (Latington Arwayo, New York (Latington Arwayo), Latington Arwayo, Latington Arwayo, New York (Latington Arwayo), Latington Arwayo, New York (Latington Arwayo), Latington Arwayo, Latington Arwayo, Latington Arwayo, New York (Latington Arwayo), Latington Arwayo, Latington Ar

#### WROUGHT-STEEL SASHES.

In this the annitary age we have come, to recognize the importance of daylight in our work rooms as well as in our houses. The germicidal effect of sun light is well recognized. Add to this the fact that gartificial light costs money, while annight is free and nothing further need be said to demonstrates the superiority of the daylight shop, both from the sanitary and the exceeded by the contraction of the same of the complex points of the complex point of the complex points of the wind, and furnishes no road the complex points of the wind, and furnishes no road the complex points of the wind, and furnishes no road section shown in the accompanying engaging the section shown in the accompanying engaging.



NOVEL JOINT FOR WHOUGHT-STEEL SASHES.

vertical bar (Fig. 2) of the mash just large abouth to admit the finance of the horizontal bar. The unifole part of the vertical bar is then preased out so as to fold iossly around the molded portion of the horizontal bar, as shown in Fig. 3. In the latter bar a mail notch is cut as indicated in Fig. 1 to act as a lock. It will be observed that the amount of underlanded the state of the control of the state of the control of the will be observed that the amount of media convex of the control of the will be observed that the amount of media of the control of the will be observed. The control of the will be observed, and this hermits of particularly state of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the material used and consequently in the weight of the particular that the weight of the material used and consequently in the weight of the particular that the weight of the material used and consequently in the weight of the material used and consequently in the weight of the particular that the weight of the particular that the material weight of the particular that the material weight of the particular that the particula

#### SAVETY VUSE BLOCK.

Heretofone when fusee such as the acrew plug, ordinary artirdage, or the open wire type, have been used, it has been customary in making temporary installations, requiring a larger capus ity than supplied by the block used in the original installation to remove the original total the original installation to remove the original total the original installation in the original installation to remove the original total the original installation to the original total total the original total total the original total total the original total total total total the original total tota

Fig. 1 is provided with a cylindrical compartment that opens at one and into a revew B and at the other east communicates through a partition I with a recess of C. Bach recess in fitted with a law galayied to receive the terminal wires of the line. The lugs are engaged by screws that passe through the blocks and serve as binding peats to hold the line wires. The lug B in the recess B is provided with surins tillus of accurate form adapted to greate the body of the fuse B. The lug P is the obsoults recess it, a line provided with



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spring cills adapted to cagage a boss of which prepicts from the end of the fuse The fuse is provided with the usual metallic contact bands and one end is furnished with a handle H. All of the fuses adapted to be used with a block of a certain ammere carrying apacity are fitted with bosses of the same size. A fuse, of isracer carrying repactly however, would have a boss of larger dameter. If nor should attempt to the boss would fall to pass through the partition I and there the cillp Fas shown in Fig. 2 and no centact would be made with the line terminals. The inventors of this shortiest large with the control of the tors of this shortiest large with the control of the Providence P. II.

#### AUTOMATIC STOCK SALTING DEVICE.

Cattle when housed or running free ha field need a limited supply of sait to ministant them in good condition. If the sait is placed in troughs mixed with feed atoms of the animals will prevent others from getting a proper amount of the sait. The accommange engagement plantates of active which affords free areas to be look. For othersing, the resolution controlled mounts are the said with the said that the commander of the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be considered at a fine fill that the said will be cover B and serves power in also hemispherical in abuse, but of the animal A hood D is thought to the cover B and serves normally to close the opening in the latter of the animal and a fine of the hood is a lip E which projects forward and is curred upward. The receptacle A is provided with a similar lip by which however is curved downward thus heaving an opening which will relate number of the said hood less than the said will be cartile to dottain the said. The animal raises the load by shoving his much beneath the lip E and coking the hood hack until it ensages a laug U. When the said would be and the first whole we will be said holder and lift of the said holders and thouse and the said from exposure to the vierness. Measure Frank and Thomas L. Pelfer of the said not lift in F. D. So. 2 have recently so were a patent on this saiting device.



AUTOMATIC STORE-SALTING DEVICE

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OF General Interest.

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| alogies.  | Talinferro  | 949,609  | Drawing rell, 3 L. Sexton<br>Drive W R. Machind  | 600,000<br>600,600  |
| logical   | Box clatop II Burch<br>Hox lid or cover, abox polish, J W Davis   | 949.145<br>949.145   | Driver, W. E. Mackind, Brill Conglish, Park P. B. Mackind, Brill Conglish, reviery, L. Manus, Brill Bondish, C. C. Hanner, Brewn Frances, G. L. Walbert, Brean Dust collector, F. G. Hemmer, Dry for chromed wood and making same, Ass. H. Outer, Breand M. Warth, M. Warth, and H. Outer, M. Warth, M. W. Wall, M. Warth, M. W. Wall, M. W. Wall, M. W.   | 14.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00<br>15.00 |
| re built  | Braiding machine A Orthmana<br>Brake J Burck  | 949 945<br>949 631   | Duplicating machine, Lorent & Boan<br>Dust collector, F C. Hemmer  | 049,456<br>048,463  |
| of one  | Brick drive E. H. Callaway  | 948,946<br>948,946   | Dye for curumod wood and making same,<br>and. H. Oster   | 姓鑑  |
| rntire<br>r good                                    | Brake J Harrk Brake J Harrk Browing process, R. Kultoma Brick drev E. H. callaway Brick anchine L. M. Pratt Broom with tetechable handle t J karst Brouts felding tooth, F E. Rreas Broom staylag, II II Belknap  | 949 945<br>949 631<br>949 551<br>948 946<br>949 641<br>949 517<br>949 643                    | inder otherwise of a financial production of the control of the co | 640,501<br>940,255  |
| about   | Sirvois with detechable issuing to March<br>Rough folding tools, Picking March<br>Rough folding tools, Picking March<br>Rough folding from the March<br>Rough for the March<br>Rough for the March<br>Balling purposes, marking for producing<br>Balling purposes, marking for producing<br>Balling purposes, marking for producing<br>Balling services, C. Rolling<br>Bandle, service, C. S. March<br>Rough and the March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March<br>March | 949,643  | Electric distribution system, A. W. Gray Electric formers, C. A. Works Heattric systems and starting systems   | 546,511   |
| The   | for 1) J Daly<br>Building purposes, marking for producing   | 940,794  | magneto, F I and B, F Remy<br>Electric machine, dynamo, E. C Wright  | 949,654<br>949,105  |
| trans-  | siafis for J C Shelling<br>Bullet C Russ  | 949 DOZ<br>949,UZN   | Electric machine, dynamo, H. G. Reist<br>Electric machine, dynamo, R. F. W. Alexan-  | 940,800<br>940,848  |
| human<br>od also                                    | Rurgiar siarus for vanits safes, or the like,   | 949 451  | Mertric markins, brush holder for dynamo,<br>W T Homsley   | 940,073<br>940,123<br>940,393<br>949,333<br>949,333<br>949,200  |
| posed   | Burner See gas burner<br>Setton, J Tama   | 949 310  | Bectric switch, C 3 Klein<br>Electric switch, L. P Coulter   |   |
| RTC 84  | Can bedy forming machine, J. E. Aleuns Can cleaning apparatus C. H. Hood Can cleaning apparatus C. H. Hood Can bedding merhine, R. J. Morris  | 940 I 40<br>940 T23  | Bloctrical switch, J 3) Hilliard<br>Elevator, P N Davey  | 949,062<br>949,388  |
| _   | Can cleaning apparatus ( H Hood<br>Can bending marbine, E. J Morris   | 949 121<br>949,003   | Elevator apparatus, alternating current, D   | 949.T40   |
|   | Caus or boxes, apparatus for the manufac  | 949 406  | Morator nafety device, II J Hoy  | 949, 874<br>949, 508  |
| _   | faming appearants A McKnight<br>(and) cuiting machine E. B. Knott   | 949 710<br>949 484   | Rugine flow air and gas eligine<br>Engine cylinders, attachment plug for, N  | NO 704  |
| :   | (ar brake J II Hand   | 846 471<br>846 484   | Engine driven by inner combustion motor,<br>A. Klose   | 949 560   |
| _   | tar door dump & Otia<br>tar feisler A ( Beeger<br>tar grain door freight P B Ratsing  | 949,200  | A. Klose  Engine indicating apparatus, P Purily Engines safety apparatus for bolating D. F Lepley Engines, timer for internal combustion, L.   | 940,739<br>940 033  |
| 3   | ter hand J C Dunkop   | 949,418  | Engines, timer for internal combustion, L.   | 949,882   |
| וני   | for J F McElroy   | 940 285<br>949 234   | Envelope safety M A Evans<br>Excavator L. A Desy   | 040 061<br>040 854  |
| _   | Car pay within II Rowntree  | 949 315  | Expanding machine, T if Kaue<br>Extension table J J Gruender   | 949 485<br>949 119  |
| .   | Lar replacer W. K. Coppers<br>Lar step register operating, F. Laugherst<br>(are waterobe baign? for sleeping J. A.<br>Halderman   | 949 250  | Fair, centrifugal 1 Kentner<br>Fairet mixing Ross & Tollinger  | 949 150<br>949 044  |
|   | ter in J. N. McKing.  Let jar a per neiter, II Blowstree Let jar ye neiter, III Blowstree Let jar ye neiter, III Blowstree Let jar ye neiter, III Blowstree Let jar ye neiter operating. P. Laugharst Let in the state of the second J. A. Carlonding or carbon Carboning on one handred jow carbon Letterring machine, automatic J. P. Brekker, Mr. M. Letterring and Line. Letterring machine, J. Hender Letterring machine, J. J. Lauder Letterring machine, J. Letterring machine, J. Lauder Letterring machine, J. Lette  | D40 447  | Pence post B Wise<br>Fence post gold or form A 1. Roop   | 040,206<br>040 UU1  |
| rk, or  | Becker  | 949 140  | Percules making cant book S. Enterine<br>Pertiliner or coment mixing machine C. R.   | 949,819   |
| er im-  | Carnet bester. H J Louier   | 946 130<br>049 192   | Pibrots and cellular material inducating   | 949 673   |
|   | t arpet averper brush cleaning device Armor   | 949 694  | Film roll bolder J H Scotthmer<br>Filter, C Hebbeler   | 949 450<br>910,857  |
| tenta-  | t see hardening or cross sting II Redman  | P40 444  | Beidington Fire slare (rap. J F Wilson   | 940 724<br>949 787<br>910 631<br>949 467<br>949 104<br>946 240<br>948,495   |
| thand   | Radman Silv 444<br>(ement or other liquids to stock touchine  | 049 540  | Fire escape ladder, W. A. Farmer<br>Fire-gran locking device, R. Frommer   | 010 A31<br>040 407  |
| to any to any th and a All Our                      | tement post M ( Noite<br>(concutation to ster parking II Rodgan   | 949,564  | Flour packing machine J Merritt<br>Flour packing machine J Merritt<br>Flue cleaner S. S. Poole   | 040 240<br>040 465  |
| denter  | Cementation compounds, retreating 11 Rod  | D40 441  | Fine point and its attachment to fine sheets<br>C. R. Coleman  | 948,631<br>949,512  |
| v   | tementaries or case bardining material is<br>Lementing low carbon from 11 Resimen   | 949 440<br>949,445   | Find presure regulating device, G S.<br>Gaster   |   |
| York  | tensenting material and making the same,  | 949 442  | Folding gate A Baining<br>Fond cattle E. S Davis Jr  | 949 180<br>949,789<br>949 416   |
| _   | Indigen and the community of the communi  | 949,493  | Prot guard R D Culter  | 949 038<br>949,649<br>949,059   |
| ONS   | Centrifucal separator H H Goodman   | 040 920<br>648 227   | Fork handle hay () Reynolds<br>Foundain, (), A Dunlap  | 049,090<br>049 20T  |
| be  | Contribugal separator, W. P. Mepherd<br>Chair bead rest Hauseh & Schelle  | 200 G05<br>GM 6949   | Proponer generator variable G Faccioit<br>Friction let off J Fuller  | 949.830<br>949 368  |
|   | Check brok J Thehadi<br>Chemicals package for C F Jenkins   | 949 T05  | Furt picker's lag E. J Manon<br>Fuel, machine for forming artificial pressed,  | 040 024   |
|   | Chuck drill J W Hhype<br>Class moistener J F Herbrick   | 949 430<br>949 430   | Fuel treating A G Mani<br>Funnel and measure, combined, W R  | 949,836   |
|   | (ignrette machin and case F W Inquing   | 940 606<br>940 067   | Former charging apparatus blast B II   | 940,074<br>949 AGR  |
| DATE  | tirenit wire covering pipes, counseling de<br>vice for T. K. Murray   | 049,241  | Furnace construction, H D Oliphant<br>Furnace grate bar R. L. Thomas   | 940,460<br>940 (65)   |
| patonis j   | Chrop etirrop, Metage r & Musre<br>Clamping attachment J Reij   | D40.241  | Furniture company service II at Holgrowe<br>Furniture construction J Abel<br>Func for electric circuits, C J Dorff   | 949.108<br>940.208  |
| 140 249<br>110 LUI                                  | Clay ballant device for use in producing<br>burni G M Brunett   | 049 241  | Pites plug electric J II Haiseon<br>Unme apparatus, W F Rehnelle   | 940 R03   |
| 040 287<br>040 139<br>040 714                       | Clock synchronising apparatus electric K  | 040 122  | Game board A Schmittner  | 949,883<br>949,897<br>940 194<br>940 164<br>949,878   |
| 010 000   | Clothes line banger safety F J Eakhardt<br>Clothes rath F La Physier  | 949 TOO<br>949 ONG   | tiarment fastener, it 1 Elson<br>flarment intent a W B Tyrrett   | 040 164<br>940 164  |
| 11 10 (103<br>11 10 134                             | toin controlled mechanism single action J<br>W Patternou  | 940 438  | Gas burner I' J Atslunger<br>Gas burner self igniting if Ruppert   | 949,050   |
| 040 445<br>940 117                                  | Coke overs apparatus for Watering coke in<br>Affekker & Gorton<br>College shirt & houteness   | 0#0 250<br>US 797  | Gan lights manufacture of intendescent<br>bothes for M you Unrah   | 910.010   |
|   | Collar stuffing machine horse Collect &   | 049 295  | Gas storliner and purifier V Streeterger<br>Gasket for pipe joints, F J Randall  | 940 mg  |
| 940 157<br>940 157<br>940 948<br>940,000            | Andrews Andrews   | 949,048  | Gem setting, J J Murris<br>Class, making sheets or plates of opalite or  | 949 657   |
| 949 727   | common seeds of Combons, and assessment of the Combons of Combons   | D40,566  | the state of the s | 040 386   |
| 949 421<br>949 421<br>949 413<br>949 119<br>949 670 | Parker  (munistage for dynamo-decriri machine, commission for dynamo-decriri machine, composition of Tadebause (suspential on Buster F \ Cindail toncrite construction relatered. F was constituted to the confidence of the confide  | 046 163<br>940 186<br>940 061  | Grader, read, J P Lates<br>Grader, read, J P Lates   | 949,109<br>949,659  |
|   | Courte construction reinforced, P W   | 949,962  | Grate J W Fowler   | 949,490<br>949,055  |
| 949 045<br>949 045                                  | steam J E. Capa<br>Conduit outlet II A Gilbert  | 949,562<br>949,217<br>949,628  | Orig device, intermittent, Poud & Wagner<br>Gun, green W & Stanler   | 049.804<br>049.804  |
| 949 450<br>949 658                                  | Conference of the Conference o  | 949 S#s  | Hair waving P E. Herrman   | 300 TH  |
| 949 748   |   | 949 261  | Harvester corn, J A fitnes   | 940,075   |
| 040 300<br>940 195                                  | Cooling and drying materials apparatus for  | 949,916  | But aim reducing device R. H. & H D<br>Cartie  | 949 204   |
| 949 5/16<br>949 5/17                                | Copper producing electrolytic & S. Ham  | 949 008  | Heat regulator, stress, J F McMing<br>Reater, T G Palmer   |   |
| 13,083  | Corn shocker B. Schell<br>Corner clamp, A II. Status  | 949,186  | Heater, II K. Moore<br>High chair go cart, G. R. Francis   | 22  |
| 949 133<br>948 874                                  | Cornet monthplace, II L. Lenberr .  | 150,040  | Rings, C R. Miller<br>Filage track Goor, I Felenman  | 蘊   |
| 949,291   | Coupling See drill coupling<br>Crafe metal shipping J A Mayer Sc  | 949, 191<br>949, 379<br>949, 197<br>949, 364<br>949, 351<br>949, 215<br>949, 215<br>949, 258 | Christian Continue Co | 040,000<br>940,000  |
| 949 077<br>949 577                                  | Cross bood, B. M Asiakson   | 946, (27<br>949,244  | back Hee check book.   | 949,855   |
| 940 134   | Caltivator, E. W Himpson Caltivator attachment, H Christofferson Cuttivator tooth, F E. & J E. Bradley Coloret, matel. C. H. Freeman  | 949,351<br>949 215   | Hook O Atkins<br>Hooper, M. M. Remier  | 舞器  |
| 949,633<br>949 434                                  | Commence antifice or chestion morbins. J [  | 949 586  | Hose weals emport fire J J Mentill<br>Hydrocerten burner D. W Young J.   | 建設  |
| 940 \$11<br>940,548                                 | Colley Current motor, J. W Myers Catter boad, M. H Lyons Cutting mill G A. & C T Sagle  | 940 482<br>949 747<br>940 198<br>940,116<br>940 929  | Hydrocarbon burner, A. B. Bruner   | 播劇  |
| MR, 548   | Cutting still U A. & C T Ragio  | 940,116<br>940 019   | Its pick, B. B. Spalke<br>ligation device, B. M. Antabase  | 盤   |
| 949,018<br>949,639                                  | Cuttor bond, M. S. Lyona<br>Cutting will O. A. C. T. Engle<br>Invanting device, W. P. Etmella<br>Destal coeffings, apparatus for making Carl-<br>horg & Eyen<br>Devict besulphere guard, O. Hirschnen<br>though pomie, E. B. Hoferhan, Jr.  | 949.391<br>(49.273<br>949,440  | Incommun. III Klinke<br>Inking roller, R. W Munk   | 拉翼  |
| 9 10 CO   | livetal numie, R. B. Hodgan, Jr<br>Biographic position finder device for cornec-  | 14,44  | Insulator for high potential absorbs & to  | 46  |
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| 949.207   | · Die bund, adjactable, J. A. Katusmerus.   | 940 875  | (rea of start strictes, therein, in the land   | 100   |

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Relleving apparatus. F. Purkt 949 580 949,139 alone indicating apparatus, P Purity safety apparatus for bolding Lepley 940 0 timer for internal combustion, Lapley or laternal conducting in the control of the U40 033 949,3852 949 951 949 854 949 558 949 139 949 139 949 044 940 050 949,208 949,319 040 834 k ad cellular material inducating Backeland Backeland bolder J II Scotchmer Heldelor washing and drying appared washing and cirrin apparent dayton. J. W. Hiem The Indeer, W. A. Parmer inching derive. R. Frommer th' derive. A. Robbinsor th' derive. A. Robbinsor the Indeed of the Indeed to the Indeed of the Indeed to Indeed of the Indeed and Indeed of the Indeed editing apparents ( B. Wellman resource regulating derive. G. S. See 948,631 948,631 or charging apparatos blast B II charging apparatus reast in ter-construction, N is Olliphant grate her R. L. Thomas v construction J Abril et al. (1) and the construction J abril et electric circuits, C J borff up electric J Il Hausson plantatus. W F Schnelle sparettes, exercising, Taylor & Barti 940.583 949,697 940 194 940 154 949,659 949,659 ard A Schmittner fastener, If 1 Elson infants W B Tyrrefi infants W B Tirret

or J. Vale Statement of December 1, 19 and 19 949 155 949 389 949,109 949,000 949,490 949,065 949 979 J W Trutter of the state of the d. profession, b. B. and W P finitely.

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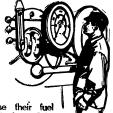
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NEW YORK MATURDAY MARCH 5th 1910

Fig. Editor is always glad to reverse for examination illustrated articles subjects of timely interest. If the photographs are sharp the articles of and the facts authentic the contributions will reserve special cuttom. Accepted articles will be paid for at regular space rates.

A TRIBUTE TO AMERICAN SHIPBUILDING LTHOUGH the general public has apparently failed to appreciate the significance of the recent winning of a \$22,000,000 order for but eships by an American shipbuilding firm competition with the leading yards of Great Britain, France Germany, and Italy, the importance of this

prante terrinary, and tasy, the importante of this matter is fully apprelated abroad.

The facts are as follows. About one year ago the Argentine government asked for proposals for two first class battleships, and it requested four American firms and all the leading foreign shipbuilders to can irrais and an the dashing for an emploiders to put in bids on the contract. The plans submitted wer not accepted. The Argenilae Commission then pre-pared its own specifications and asked bids from a salected number of these contractors. On the receipt of the second lot of bids it again narrowed the com-petition down to one American from, the Forr River Company two English firms Vickers Sons & Maxim and the Armstrongs and one company each from Ger many, France, and Italy As a result of this last com petition the award was given to the Fore River on designs and price submitted by President Francis T s, formerly Chief Naval Constructor United States navy One of these ships will be built at the Fore River yard and the other by the New

Nork Shipbuilding Company
Judging from such particulars regarding the design
of the vessels as are available, they will be the most powerful fighting ships affoat at the time of their Although in displacement they will not exceed two intest battleships the 'Wyoming and 'Arkan the disposition of their twelve 12 inch guns is such that they will have a considerably more powerful tion of fire on every point of bearing excep m This advantage is secured by placing the two ship turrets in diction or diagonally, an arrangement which permits the four guns in these turrets to he trained dead ahead or dead astern as may be de sired Since the four 12 inch guns in the pair of turrets in the bow and at the stern can be trained axially, this ship will be capable not only of concentrating all twelve guns on either broadside as will be done by our Wyoming class, but also (ight guns dead a and eight dead astern as against a fire of four ahead and four astern for the Wyoming 'The belt is to be 10 inches in thickness and the speed 22 knots Apparently, unless some other features of the ship have been sacrificed this vessel represents the high relopment of offensive power yet attempted in the history of warship construction

the American tender was lower than that of That the American tender was lower than that of such firms as Vickers and Armstrong is explained by the fact that armor plate and the steel for the hull construction can be obtained at a lower price in the l'uitled States than it can abroad, the difference in this regard being so great as to more than offset the high cost of American labor. Whatever be the reason for our success, the fact remains that the place ing of this large contract with an American firm adds greatly to the prestige of our yards and testifies to the high point of excellence to which warship construction has been carried in this country. In this connecpaths of the United States to any proposed m ures for the resuscitation of our merchant marine has reduced the construction of merchant vessels to such a low point that our leading shipbuilding vards are to-day kept alive almost entirely by government orders Nor must it be argued that the securing of for work. Nor must it be argued that the securing of this large warship contract proves that there is no necessity for government assistance in the upbuilding of our merchant morine, for the question of the sales cost of running a merchant ship, which is much

higher in the American than in foreign service, do not enter into the consideration of warship construction Moreover, the competition in the construction of merchant steamers is much keener and the prices are rela-tively lower than for the construction of warships

#### COULD THE EARTH COLLIDE WITH A COMET?

N May 18th next the earth will be plunge into the tail of Halleys comet and th head of that body will be but 15,900,000 miles away it is but natural that a think-ing man should ask is there a possibility that the may encounter a comet and thus come frightful and?

Curiously enough, it was Halley himself who first cointed out the possibility Whiston Newton's successor in the Lucasian chair of mathematics at Cambridge was so slarmed at "a charlot of fire' which flared up in his day, that Halley was prompted to look clos into its movements. His work led to the startling reinto its movements. His work led to the startling re-sult that the counts, when passing through the descend-ing node had approached the earths path within a run idiameter of the earth Naturally, Halley won-overed what would have happened had the earth and the comet been actually so close together in their respective orbits. Assuming the comet a mass to have b parable with that of the earth (an assumption which we now know to have been utterly beyond reas concluded that their mutual gravitation would have caused a change in the position of the earth in its orbit, and consequently in the length of a year. This train of thought led blin to consider what the result of an actual collision would have been, and he concludes that so large a body with so rapid a motion were to strike the earth-a thing by no means impossible shock might reduce this beautiful world to its original

Hence Halley not only dispelled the superstition the terror which once followed in a comet s wake, but also pointed out a possibility which the superstitions Dark Ages had ever dreamed of It seemed to Halley not improbable that the earth had at some remote period been struck by a comet which, coming upon it period been struck by a comet waten, coming upon a chilquely had changed the position of the axis of rotation, the north pole baving originally, he thought, heen at a point not far from Hudson's Bay The more recent investigations of Kelvin and Sir George Darwin

ompletely upset any such theory Since Halley's time the chance of a collision be tween the earth and a comet has engaged the attention of many astronomical mathematicians Laplace, for example, painted the possibility of a collision with the arth so vividly that he startled his day and generation He drew a picture of a comet whose mass was such that tidal wave some 13 000 or 14,000 feet high inundated the world, with the result that only the higher peaks of the Himalayas and the Alps protruded Lalande created a panic by a similar consideration of the subject in a paper which was intended for presentation before the Academy of Sciences, but which was not read the Andermy of sciences, our which was not read Such was the popular excitement, that he felt himself constrained to allay the public fears as well as he could in a scothing article published in the Clazette de France The masses assumed by both Laplare and La lande are so preposterous that their theories are no longer seriously considered by any same astronomer

Since the day of Laplace and Lalande there have been several comet "scares" Biela's comet crossed the earth's orbit on October 29th 1832 When that fact was announced, Europe was in a ferment The orbit of the earth was confused with the earth itself was the popular excitement, that Arago took is upon himself to compute the possibilities of a collision He pointed out that the earth did not reach the exact aport where the comet had intersected the earth's orbit spot where the comet had intersected the earth's orbit until a month later, on November 30th, on which date the comet was 50,000 900 miles away Incidentally he pointed out that a collision was always happily remote. Ht thought that the chances of a meeting were about one to 28100,000 Babinet, on the other hand, thought that a collision was likely to take place hand, thought that a collision was likely to take place once in about 16 600 000 years. More recently the en-tir, problem has been considered by Prof W H Picker ing of Hararat By a collision he understands, first, that any part of the earth strikes any part of the cornet sheed, second, that any part of the earth strikes the most condensed point in the head (the core) and distinguished from the larger nucleus. What the average size of a visible comet's head may be, we have means of knowing Young estimates that for a telescopic comet it averages from 40 000 to 100,000 miles in diameter. The head of the great comet of 1811 was 1 200 000 miles, that of Holme's comet in 1892, 700,000 miles, and that of naked-eye comets generally over 100 000 mile

In the last half of the last century 121 con cluding returns penetrated the sphere of the earth's orbit From this Prof Pickering infers that we should expect to be struck by the core of a visible comet once in about 40 000 000 years, and by some portion of the head once in 4 000 000 years. Since comets' orbits are

regions of the sphere, the collisions would occur rather more frequently than this, but hardly as often as ones in 2,000,000 years, and since it has been estimated thai animal life has existed upon the earth for about 100, 000,000 years, a considerable number of collisions, perhaps as many as fifty, must have taken place during that interval, in Prof Pickerings opinion, evidently

without producing any very sorious results

The old notions of the tidal effects of comets were based upon an erroneous conception of cometary masses. It seems astonishing that a man of Laplace's wonderful mathematical powers should not have con that a body like a comet, which can sweep through the entire solar system without deranging @ one of its members, must have a mass so t that it cannot appreciably affect the waters of the As it is, comets are more likely to be captured by planets (witness the comet families of Juniter and Saturn) than to derange a member of the solar syste or to produce tidal effects.

plunging of the earth in the tail of Hall comet naturally causes many to wonder what will be the effect upon the inhabitants of the earth Similar passages occurred in 1819 and 1861 but no one was the wiser until long after. Some astronomers claimed to have noticed auroral glares and meteoric displays at the time, but whether these were really associated with the comet or not cannot definitely be stated At all events, it may be safely held that on May 18th next none of us will be aware of the fact that we are literally breathing the tail of Halley's comet From this it may well be inferred that the wild tales of the possible effects of poisonous gases, tales for which the new papers are very largely responsible, are uterly wither foundation It is true that a comet's tail is compose of poisonous and asphyxiating hydrocarbon vapors as or poissones and asphyxiating hydroarbon vapors and of tyanogen, but it is also frue that the actual amount of toxic vapor is so small that when the earth is brunked by the tail of Halley's comet, the composition of the atmosphero will not be so affected that a classist could detect it Flammarion has drawn a vivid picture in his 'La Fin du Monde' of the possible effe passing through a tail highly charged with vapors. He has shown us terrified humanity gasping for breath in its death struggle with carbon monoxide gas, killed off with merciful swiftness by cyanogen and dancing joyously to an angesthetic death, produced by the co sion of the atmosphere into nitrous oxide or destist's 'laughing gas' No one of any common sense should he alarmed by these nightmares particularly when it is considered that so diaphanously thin is a comet's tail, that stars can be seen through it without dimis

#### PATRIT .COMPLEXITIES IN GREAT BRITAIN. N the course of a judgment in an important se

case before the House of Lords, the supre tribunal of Great Britain, the Lord Chancel lor made very pointed references to the lor made very pointed references to the complexity with which patent specifications are sometimes encumbered. During the past few years there has been an increasing tendency to render such pecifications as intricate and as voluminous as sible, thereby obscuring the vital issue Only a weeks previously the Chancellor complained in an other action of the manner in which claim and narra tive had been so intimately interwoven that considerable difficulty was experienced in unraveling the real factors in the issue Such a tendency, the Lord Chan-cellor pointed out, defeated its own object, for where patent specifications and claims were so framed as to puzzle a student, business men were afraid to take out a license for its working, for fear their interpreta tion of the patent might be found to be erroneous, be found guilty of infringement, and be mulcted in heavy damages The particular case in which the Leve Chancellor was constrained to make these comments was in connection with improvements in the casting and trimming of stereotype plates. The court contended that the specification of the original pates was extremely voluminous and complicated, amount-ing almost to the bulk of a treatise, in which there was infinite redundancy and repetitions, and constant references to illustrations which were somewhat difreferences to illustrations which were somewhat car-fecult to follow it was a document which needed a prolonged and penetrating study in order that may one who wished to work out problems in this partice lar field of industry might know how to avoid all pos-

ible risk of infringement.
In the course of his remarks the Lord Chancellor pointed out that inventors who drew up such compli-rated claims must run the risk of the whole patent s declared void by the court on the ple biguity The framing of specifications in this man-ner he declared to be an abuse of the law, and he gave the warning that it would be checked, if the ocgave the warning that it would be checked, if the or-casion arose, by the simple process of declaring the patent invalid. These timely remarks have been reactly appreciated by British commercial and mann-facturing establishments, and there is no doubt that advantage will be taken to draw up specifications in a more concise and itself manner.

#### Engineering.

The Chaeste modal, founded by that celebrated as glacer, Octave Chanuts, and awarded by the Western Boolsty of Engineers for the best paper precented during the year, has been gives to Ford Taibot; University of Illinois, for his paper outlied "Tests of Cast Iron and Relatorved Concrete Cuivert Pipe," which embodied results of a research extending over a number

The Interests Commerce Commission points with pardonable price to the saving of life and limb which has resulted from the operation of the safety applinace law In 1890 one out of very 340 men employed in car coupling was killed, and one in 13 was injured, whereas in 1800, one out of 89 was killed, and one out of 49 was injured—an increase in the factor of metry against cleach of 1814, and against injury of

In addition to the three dreadought battleships which are being built for the Brazillan navy, the pregramme of construction includes ten destroyers of the stanks segoing type being built by Messra Yang Siz ser in commission and the seventh recently exceeded her speed of 27 knots during trials on the Cyde, carrying a load of 100 Loss. These ressels are 340 fest long and they are propelled by twin reciproculting engines of 5,000 herespower

Mon 3. Arnold has been appointed subway negineer for the city of Chicago, and it is probable that should nise miles of subway will be put under construction fortwith. The city has ansike inter funds for this purpose from its accumulation from the street rulivary company's directions, and the street-are companies are bound to excitate the contribute of the contribute of

There is much significance in the recent capture by the Germans of seweral big contraris in this country. The Rhenish-Westphalian works have contracted to be bedd three more 1,0000-horse power turbines for Nigarar Palla power plants, which will make fifteen in all with a total horse-power of 1,0000 Other (1,0000 Other (1,0

These is much talk in the air about the construction of a 30,000-ton battlenship for the littled States may and its cause is to be found in the advent of the new and very powerfail i-finely gain, which recently underwant uncessful tests at Sandy Hook. If the it successful tests at Sandy Hook. If the it successful tests at Sandy Hook. If the it successful tests are the "Wyoming," an increase its remain the same as in the "Wyoming," an increase in displacement becomes necessary Indeed, it is questionable whether even a 30,000-ton ship could mount twelve i-finely gain and give them adequated

Only these who have witnessed the great contestion on the present subway can understand the suprementation to the content of the suprementation afforded by the determination of New York cities were witnessed to the Public Bervice of the Public Bervice of the Ways at a cost of \$100,000,000. The routes include an entirely new north and south subway from the Broat to the Battery by way of Lexington Avenue and Broadway, and a subway in Brooklyn connecting the lines over the Williamsburg Bridge with the new Fourth Avanue route in Brooklyn, the latter to have elevated extensions to Fort Hamilton and Coney Island

The Faderal authorities have approved of plane for the opening of the Delaware filter to a navigable depth of 13 feet as far as the city of Trenton, and it is believed that the development of deep-water navigation farther inland will be only a question of time. In Natroe stupendous work of the shoracter has been done Manchester spent \$80,085,000 on the 35-mile canal, Delaberg in German, 160 miles from the month of the Rhine, and Cologne, 150 miles from the month of the Rhine, and Cologne, 150 miles from the control of the in free communication by water with the seaboard.

REC. Googra Gibbs, Chief Engineer of Riccire Tration of the Pennayivania Tumin and Terminal Rail road, in a report made at the last session of the International Railvey Congress gives some comparative faerace of economy of the West Jersey and Seashors Railway and the Long Island Railroid on lines that lever formerly operated by statu. During 1908 the Long Island Railroid operated the storic line at 17.30 cents per sair mile as against a cost of 17.50 cents for stans per sair mile as against a cost of 17.50 cents for stans once ways 8.45 downth for shorter in against 13.50 cents for steam mineage. The relatively unknownthe results or steam mineage. The relatively unknownthe results for the control of the standard of the term service therefore wite couldy; whereas on the Swat Perey Road the the Long Island Railroid and the telem service therefore wite couldy; whereas on the Swat Perey Road the of the electric, and most find service was express and the standard of the service was express with few store and therefore of an exceptionally soc-

#### ELECTRICITY.

The first Edison medal of the American Institute of Electrical Engineers was awarded to Prof. Billu Thomson for his achievements in electricity, on the occasion of the anniversary dinner of the Institute This medal was founded by friends of Mr. Edison, and is intended to commemorate his work

A remarkably ions wireless transmission was reently recorded by the steamship "Tennessee," five days out from Honolulu, which succeeded in catching a nessage from Table Bluff on the coast of California. The message was a weather report, which was after ward verified by the Navy Department The distance of transmission was 4,550 miles

A recent test of wireless telephony was made to show its value for transmitting music. Several selections were sung in a transmitter at Park Avenue and Fortich Street, New York, and were listened to by a group of newspaper son at the Motropolitan Tower. At times the singing was very but frequently it was impossible to heer enything but a contract bir of sound.

A portable transformer drying apparatus has been devised to dry out transformers that have become moist during shipment or storage. The apparatus consists of a furance adapted to hum wood or charcost A current of air heated by the furance is forced through the transformer by means of a blower driven by a small motor. The air, before runching the blown, is filtered through several thicknesses of

The talephones used on the assumable "Instantal require interesting The induction coil condensor, and bell of the instrument are inclosed in a small white ename box, and the switch hook which profess from one afte is provided with superial retaining delete to prevent the receiver from being knock between the provided with superial retaining delete to prevent the receiver from being knock between the receiver from being knock and and the receiver the second of the ship. The reveiver is allowed to rick to not be box, otherwise the lever would like and nake a false connection when the ship was pitching one realizer.

A recent number of the Electrical World describes a very interesting electrical installation on an illustration of a result of a gas-producer in a realisation supplying a 38-horse-power two-yrident para engine to which a 148-liowatt 155-wit direct-current generator is belied. The online also runs a generator is belied. The online also runs a first product of the second products of the se

A new type of long-distance telephone was recently retested aucocardity over a circuit extending from New York'to Chleage by way of Pittsburg, and return The lawation of Dr. Tardisu of Arles France consists in taking the pitth of the measure two o taves and a third by means of a combination of drains. At this light pitch the waves are sharp and abort, and rust turnmitted over a greeter distance than is possible to the pitth of the reserved of the control of the contr

At a revent meeting of the Institute of Electrical Registeers in London a differential electric thormon eter was described by Prof J. A. Plenning. The ther momenter consists of two large flass tubes, nealed air tight at the top and bottom and connected by a tube of fine hore to which it is thread of relored water confine hore to which it is thread of relored water conresistance is to be measured are placed in the tubes, and one of them is connected with a source of high frequency current while the other is connected with a source of direct current. By introducing resistance into the circuits, the heat may be regulated until it at he same in bott tubes, as will be indicated by the table and the control of the con-

A report on the trackiese troller gratems near Vienna has recently been made by the United States Consul General there situated. The current collector used con sists of a small frame supported on the growed wheele which run on the positive and angative wires. The wheel is prevented from jumping the wires by a weight of personal properties of the weight of personal properties. The properties of the propert

A five-mile test of the Edison Beach storage battery our was made here last wook over the 32th Street horse-cut recits. The car carried a number of engineers, who were to judge of its availability for streetcht service in New York. If their decision is favorable Effects of the cars will be put is to service.

#### SCIENCE.

Dr. E. E. Barnard of Veylon Observatory secured photographs of Count & 1990 on January 21st, 34th, and Pebruary 1st, 3rd, 4th, and 8th Cloudy weather prevented the tating of any other photographs. Dr. Barnard informs us that one of the interesting features of the comet was an extension from the head about one-quarter of the features of the country o

The mechanical inhoratory of the Polyrechile Institute of Worrowier, Mana, his undertaken a study of the relative thermal conductivity of rolled copper and of copper deposited by eiter tropies and not rolled The conductivity of the rolled copper was found to acceed that of the electropic copper by 30 per cent. This is an interesting instance of the change in the Annical treatment metals which is produced by mechanical treatment.

Obali and its, in the liquid state, are miscible in all proportions, but solid evolati dissolve unity about compounds Cable and Cable. Cobalt and antimory also mix in all proportions in the liquid state folial cobalt and antimory also mix in all proportions in the liquid state folial cobalt can alway 12% per cent of antimory, with which it forms the compounds Cable and Cable. Cobalt and leafter no definite solid compound and, even in the liquid state each dissolves only a small quantity of the other The same law governs the alloys of cobalt with bismuth and thaillium. Cobalt and site, raced fagather, deposit alloys in whith the definite compound CaZe, has been found Cobalt and well as in the liquid Cobalt and silicon mix in all proportions in the solid as well as in the liquid Cobalt and silicon mix in all proportions in the solid as well as in the liquid Cobalt and silicon mix in all proportions in the solid as well as in the liquid Cobalt and silicon mix in all proportions (Cable Cobalt Cobalt Cobalt Solid Cobalt Cobalt

ropean sportamen are beginning to fear that game will be made scarce by the multiplication of acre planes, balloons, and other aerial vessels it is well known that where many kites are habitually flown they have the effect of driving the game to other districts The effect of a kite however, is very small in compari-son with that of an aeroplane or a dirigible balloon A German landowner, strolling over his estate saw two black storks which had been standing, with a two black storks which had been standing, with a number of ducks, on the bank of a pond, suddenly take to flight, without apparent reason. The next instant the ducks quacking loadly, took wing and were soon out of sight Looking around for the cause birds' affright the proprietor saw a dirigible balls which the birds had probably perceived before it be-came visible to him. He learned afterward that deer browsing in the fields, had been frightened by the sight of the airship or by the noise ma pellers and had fied to the forest. All animals are terrified by airships. Partridges quall, and other game birds crouch and hide while domestic fewis after ud warning notes the instant they perculae the trous bird of prey. The Swellsh aeronaut Von Hoff ken, while sailing at a moderate clevation observed that elks, foxes haves and other wild animals fied at his approach and that the dogs ran howling into the houses. While the Zeppelin III was going from his approach and that the dogs ran howling into houses White the Zeppelin III was going for Disseldorf to Essen the atronauts on board noted to horses and cattle galloped frantically over the fi-on catching sight of the airship

One of the scientific developments of recent years has been the formation of international organizations for the ronatderation of important subjects. International control international organizations for the ronatderation of important subjects. International control international contr

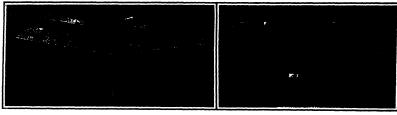
# TWO REMARKABLE SHOWS

#### NOVELTIES IN MOTOR BOATS AND AEROPLANES

The shift annual motor load show to be leid in Multion Square Garden opened on Firmary 19th and loads do not week. The show this year was larger than the shift of the shift of the shift of the shift of the various species and size exhibited. These waited from 10 feet to 40 in highly and in motive power from 1 in too house power. Alton there some fifty loads of various types were visibilited expressing a total tile of E. 2000. The largest visibility of anyon firm was that of the Electric Launch Company of Bayonne

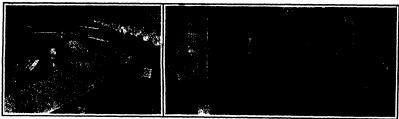
The sixth annual motor boat show to be held in Madison Square darks a negacid on Pistranty 19th and shaddown Square darks a negacid on Pistranty 19th and shaddown Square darks in season of 100 miles on one charge, this company showed a 42 foot making any part to make fitted with a 49-horse-source period of 100 miles on one charge, this company showed a 42 foot making any part to make fitted with a 49-horse-source species and 42 except the state of 100 miles on one charge, this company showed a 42 foot making any part to make fitted with a 49-horse-source part of 100 miles on one charge, the fitted with a 49-horse-source part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company of 100 miles on one charge, the company showed a 42 foot making any part of 100 miles on one charge, the company of 10

with a 60-horse power 4-cylinder Standard motor, and capable of a speed of 15 miles per hour This boat has a large open cockylt fore and att for fair weather. and a sarge open coccupit fore and art for fair weather, and a space loss cabin amidships. The engine is placed forward in a separate compartment and the controlling levers and steering wheel are placed side by side. Other firms exhibited crubers comparable in size to the best just mentioned and fitted with all the conveniences nosided on this type of craft. (Continued on page 200) (Continued on page 209)



Paulhan's Langley type prize-winning model accopiane

General view of Boston Aeronautic Show; Monoplane Exhibit



Interesting full-size Aeroplanes exhibited at the Boston Aeronautical Show

h Autoins to Type monoplane appears in the foreground and the Burlingson into in the sent distance. The pilders are seen between these two machines and the Herring, hiplane appears on the platform in the distance.

The movel L, A. W. biplane, with its revolving cylinder, air cooled. Secycle motor. The heavy curves and construction of the planes.

Is a noticeable feature.



General view of the Sixth Annual Motor Boat Show in Madison Square Garden, New York.

# RAPID PROGRESS OF THE NEW YORK STATE BARGE CANAL

A RECORD OF RECENT ACHIEVEMENT

The large amount of work done on the New York State Barge Canal during the past year augurs well, not only for the completion of this great work within the contract time but for its being done within the estimate of total cost of \$10,000,000 Almost as much construction work was completed during the aggregate of the work under contract is \$14,188,229. It is satisfactory to know that this has been as omplished at a saxing of \$25.72.08 over the estimate of 1903 for the same work. Construction work to the value of more than \$16,000,000 has been done nearly one-half of it during the year 1909, fifteen out of the

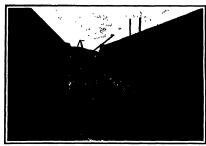
ing Lake Eric at Buffalo at an electrion of 56.56 feet above sea level the new canni follow the Ningam River to Tonawanda Creek and those runs case-ric to the Oswego River and to a pure from with the Dirak on River at Waterford After (intering Tonawanda Creek It follows the stream to Leekport when a die





View of lock No. 5 at Northumberland

One wall of a lock, showing massive character of the concrete masonry





Erecting the lock gates at lock No 11 at Comstock.

A section of the completed canal at Miller





Laying the concrete floor, lock No. 12 at Whitehall.

Another view of Comstock lock No. 11 showing retaining wall.

#### PAPID PROGRESS OF THE WEW YORK STATE BARGE CAWAL

year as was accomplished during the whole period of construction preceding, and the plans that were worked out to completen equal 80 per cent of the amount of similar work done in any previous two years, that is, if we consider the mileage and the size of the esti-

On January 1st, 1910, some 314 miles of the canal, or 75 per cent of the entire work, were under contract, the remainder of the plans were nearing completion and will soon be ready for letting, and the fitty four locks are practically completed, and by the spring of next year the eight movable dams of the Mohawk River will be in operation. The north has now reached a stage where it is possible to predict both the time and cost of the completion of the entire

By studying the accompanying map, profile, and cross sections of the canal in connection with the following outline of its principal features, an adequate conception of this great work may be gathered. Leav-

sent of 101 feet is made by means of two looks theme for it a 60 mile havi to Rechester. Beyond Rockes for the new and coincide a with the old cond until a suiters the River Cybe mear Lyons. Baxond town a large state of the condition of the con

-

depth of the river being increased by the use of fixed dams From Oswego River the canal extends easterly following the river to and across Osedda I also and through the valley of Wood Creak to the city of Rome Heres the canal crosses the drivide by a series of locks and enters the valley of the Mohawk River The canal in the valley of the Mohawk between Uitas and Scheneciady will be provided with nine movable and two fixed dams eight of the much easter dams will have a maximum lift of 15 fc 1 and a maxi-mum death on the sills of 20 forts and these series

mum depth on the sills of 20 feet and these struc-tures will a rve to control the high floods of the Mohawk The canal enters the Hudson River at Water ford by a series of five locks while will bring it down from an elevation of plus 1 I feet to tide level From Waterfor! the important branch known as the Cham plain Canal runs north to the lake As far as Fort Betward the location lies in the Hudson River and beyond Fort Edward it will be on an entirely new location making entry into Lake Champiain through location making entry into lake Champian through Wood (resk with will be canalized by the use of fixed dams The (anadian government has planned ite construction of a waterway with a depth of 19 teet from th mouth of th rew canal through Lake Champiain to Montreal

Champiath to Montreal
Naturally a work of this magnitude passing through
an undulating country and through saveral important
cities involves an immense amount of structural work
in the way of dams locks bridges and other masonry and steel work. There will be a total number of fifty four locks whose lift will vary from 6 feet to a maxi mum of 40% feet these taking the place of the seventy two locks of the old canal All of the locks will be 47 feet wide with

workable length of from 300 to 310 feet The masonry The masonry
work throughout
the whole canal
will be of con
crete All lock
gates will be of
steel electrically
manufad For the operated For the control of rivers and streams and the impounding mit supply there will be thirty fiv dams of the fixed and movable

The total quan The total quantities of excava-tion and construc-tion are necessar-fly very large in cluding in round numbers 58 000 000 cubic yards of dredging 57 000 000 c 1 b 1 c vards of earth yards of earth excavation, 11 000 000 cubic

900 000 0 to bic yards of rock ex cars\*ion and about 1000 000 yards of embankment and back filling making a total of about 143 000 000 (ubic yards In the masonry structures will be four and a quarter million cubic yards of concrete. The total length of the canal is 442 miles

canal is 442 miles
The Legislature in 1809 created a Canal Terminal
Commission whose task was to inspect the canal harbors connected with the Barge Canal as well as harbors where canal freight is either shipped or delivered and to report to the Legislature their findings
We have to give a digest of this report in due course
is the columns of this temporal. In this companion it we note to give a signer or this report in one course in the columns of this journal in this connection it is of interest to note that the interest of the Federal government has been enlisted in the project to form a large terminal harbor in Januales Bay with entrance channels at sufficient depth to accommodate seagoing bearing on the question of canal terminal facilities

#### arite Conl Bods of Alask BY DAY A ME WHILEY

The extent of its gold and copper deposits has given Alaska its principal reputation for mineral resources The quality at d area of these cres have called publi attention to them to the neglect of other minerals and

attention to the ut to the neglect of other minerals and the bulk of the mining in the territory has been done to separe these own Consequently coal mining and humbering are partial ally underviologi industries Advange the recologist and mineralogist have been in gastiffully Alaska for a period of years most of the partial properties of the properties of the recologist of the properties of the properties of the properties past with Emission. Owing not the deficulty of samina

cro portion of Alaska, accurate information of its inte-eralogy is available in but a small fraction of its total area. Here however the study of the formation has area. Preve newwer tas study of the tormation has been so therotogh that the existence of very large deposits of coal has been revealed and accurate ent mates made showing the localiton of the veine also the thickness while the quality of the fuel has been the thickness while the quality of the fuel has been the thickness while the quality of the fuel has been the thickness while the quality of the fuel has been the thickness while the quality of the fuel has been the thickness while the quality of the fuel has been the thickness of the fuel to the fue Survey agree with the reports of experts who have been sent to Alaska to get data for mining and investment companies

The investigation of the coal bearing area has been largely centered in the vicinity of the coast and two The investigation of the cost owners are also need to be a second to the cost of the cost

squire noise. Up as the precept that there no issues of transporting this out to making as tended no making his best dama but is have been opposed in promoted and the tree a large number of vottes panelically overeint a large number of vottes panelically overeint clarific direction gives the believing results

|   | Mojetare | Volatile<br>Matter | Pizziel<br>Carbon | 40            | -           |
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| Maintenia River och<br>ing, average er sistem<br>analyses<br>Sakhituurippes—<br>Igtannaka River | 911      |                    |                   | 11 00<br>6 07 | 0 H<br>0.85 |
| Koyakak Miver one<br>mangin<br>Matica Review one comple<br>Alaska Paricuttis, sync.             | 15       | #2                 | ##                | 18            |             |
| age of the sasiyons   | **       |                    | 4 13              |               | 100         |
| of cloves malyon.   |          | æ or               | e n               | **            | A PE        |
| with The  | 6.85     |                    | ##                | 18 18         | 0.66        |

Since the anthracite coal deposits of Pensystvania would be naturally contrasted with Alasina as a fuel element some analyses of the more notable Pessys-

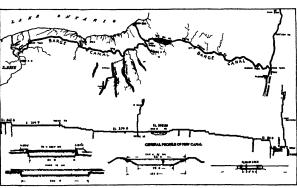
| Pa. Region   | Water | Lydrocarbon         | Final | 温    | *** | Salpires. |
|--------------|-------|---------------------|-------|------|-----|-----------|
| Williamberre | 18    | Lydrocarbon<br>4 86 | 22    | 19 M | 13  | 12        |

A comparison of the analyses of the cosi is the Matanuska field and the two regions yielding the high est grade of an-thractic in Pens-

thracite in Penaindicate that the Alsakan is of slightly better quality for sease ating best. Its percentage of fix ed carfon 5432 is greater than the bercentage in the Wilkes-Barre region while the percentage of sain is 200 less than indicate that the the other The proportion of sul phur 087 is the least in any an-thracite coni found thus far in

America. While the area of the Matanuska region is limited i n comparison with the Appala chian field it is but a small area of the territory known by commi

nation to contain deposits of an threcits and bitu minous many ction of railways deponits of an interesting and better the construction of a second relation of the construction of the



Plan profile, and sections of the New York State harge canal BAPID PROGRESS OF THE NEW YORK STATE BARGE CANAL

beds varying from six to twenty feet in thickness are exposed in this region with some local swellings, giv exposed in this region with some local swellings, giving a much greater bickness in quality the coals vary from an anthractes with 84 per cent of fixed earlier to a seal-fittibulinous with 74 per cent of fixed carbon and include some varieties that will colk acrbon and include some varieties that will colk acrbon and include some varieties that will colk acrbon and include some varieties that will colk carbon and include some varieties and include and includ

the coast in barges

The Matanuska may be considered the most imp

the count in harges

The Melanusta may be considered the most important for commercial purposes thus far discovered in a considered for the commercial purposes thus far discovered in a considered for the considered for the

Scientillo American

Therefore, is specially be the political of a rational for this field, is a supple is residually over which a rational for this field, is a supple is residually over which a rational for this field, is a supple object which is other in manufactured of the desappers, it will be a fewer if in the formation of the part of the presentation of the part of the presentation of the part of the p

controversy.

Coal was found near Cook Inlet by the Russians as
far hack as 1855 but the entire output of the torritory
his been insignificant as shown by the product of less
than 10 000 tons of all kinds in 1909—none of it anthra

#### THE " STAR -- OUR LATEST DREADSOUGHT

THE "FYAX —OUR LATEST DERLANDESSAY.
The spirited drawing on the route page of this issue represents our latest freedheegist the Ulah room!
I hamshed from the paris of the New York Ship building Company Camden N J She is shown selection in a gale of write against a heavy Atlantic visitanting it again of write against a heavy Atlantic high research and the selection of the select huge vossel as she rides over the long Atmusto convention will do her full share of pitching and rolling as she climbs and descends each majestic sea. Several cable down the slope of a sea whose crest is sufficiently high to bide all but the funnels and masts

conditions are no mere creations of the artist s Trasse conditions are no mere creations of the artists a fancy for we have recently seen a series of pictures taken on our fact when it was steaming northward in a heavy gale on the Pacific in which only the tops of the funnels and the fighting masts of some of the ves reis are visible the ships lying deep in the trough of

But although the Utah in spite of her full load displacement of over 25 000 tons will be to some extent the sport of the elements her great weight and slee will make her a far steadler gun platform than is afforded by the 18 00-ton Connection. slee will make her a far steedler gun pisterru than is afforded by the 1600-ten Connection or the 12000 ten Taisine and herein lies one of the most important advantages of the big over the medium size warship. The Utah which is a stater ship to the Florida now nearing completion at the New York anayy and is 5214, feet long 38 feet 145 inches wide and on a normal displacement of 3125 tons her draft is 38 feet. is salie, post long as force the places when him one of the places when him one of the places are not such as a mermal displacement. It should be explained she will have a full supply of anomanition and two thrieds of full supply of stores and result the place and the place of 20 ft house of 20 ft house of 20 ft house of 20 ft house of the place of 20 ft house of 20 ft

Like the North Dakota and Tolsaware the Ulbal earlies des Histohn iques to the main battery. They are mounted in pairs in balascoot turrest the skepoul tolon of which is shown very clearly in our comprehage of the skip. The foremost pair of game has an element of the skip. The foremost pair of game has an element of shoot at point plant has a command of about 10 feet. The smooth pair has a command of about 40 feet. The game of three number 2 have a command of about 30 game of three number 2 have a command of about 40 feet. second pair has a command of about 40 feet. The groun of turnet number 2 have a command of about 15 feet and these in number 4 and 5 of about 15 feet and these in number 4 and 5 of about 15 feet and these in number 4 and 5 of about 15 feet and 16 feet about 15 feet and 16 feet and

water, and of the guns is exceptionally well worked out in these vessels, being in this respect an improve most even on the 'North Dakola' herself one of the best protocted adaps ever bein! In the first place with a view to ilmiting the destructive effects of a torpedo a view to similing the described the effects of a torpedo blow particular attention has been paid to the question of cellular and compartmental subdivision. Even in the event of most serious underwater injury such as might be done by a footing mine the ship is able to concentrate on any compariment or set of compari-ments such a great capacity of pumps that she would be able by the aid of these alone greatly to mitigate the effects of such a blow The armor plan of the Utah is probably the most

The armor plan of the Utan is probably the most complete and effective yet put upon any ship. The main belt over \$ feet wide has an average thickness amidable of 11 in hes. Above this is a second belt \$ feet wide of an average thickness of \$ inches. The lower waterline belt is continuous from stem to stern lower waterine best is continuous from seen to stern and the upper best extends from the wake of the for ward to the wake of the aftermost turret. The turrets of the 12 inch guns have from 13 to 8 inches of protection. The 5 inch secondary battery amidships is protion The 5 inch secondary bettery amidalities is pro-tored by 4%, londess of armor and a similar thickness protects the cassmates of the six gens at the bow and after. Detween such pair of 5 inch guess is a splinter bulkhoed of 5 inch armor and best of such hattery is a longitudinal wall of 3 inch armor with closes in each 5 inch gun. To reach the base of the amobients ks any shell would have to pass through 9% in the sof armor— shell would have to pass through 9% in the sof armor—

as super's profe tion

It will be noted that the ship is provided with two
of the new lattice work fir-control masts with which
all our latest ships have been equipped. The handling
of the beats is done by two beat crance pin ed abreast of each other one on either side of the after amoke stack. In this ship as in all our dream ughts the officers are berthed on the main dick forward below recastle dock the crew accommodation being aft This places the officers near the bridge and convenient The ked of the Utah was laid March 1 to 190) so

that considerably less than a year has claps I be tween the laying of the keel and the launch in I se than a year from the present time if all goes well this fine ship will have her tright a speed in warship this has saip will have nor trains a speed in warming onstruction which is greatly to the credit of the New York Shipbuilding (ompany Particular interest will attach to the trials of this vessel for the reason that abe will be the first of American batticalips to be pro pelled by 4 screw Parsons turbines

American Houses and Gardens for March The current number of American Homes and Gard ens contains pictures of interesting California bunga ems contains pictures of interesting California ounga-lows coating from \$1000 ji ward an article of the fur-nishing of the apartment by a well known author ar-article on the interior decoration of the home d voted to a propriate wall papers for the various rooms voted to a propriate wan papers for the various rooms of the bouse and views of a number of interesting houses showing interiors exteriors and floor plans. The fourth prise garden of the American Homes and Gardens competition is also published in this issue as well as garden notes devoted to fifteen good liller There is also an article on open-air orchard heating and an article on the combined for ing bed and stor and an article on the combined forting bed and stor-age bit One of the most interesting articles of the paper one which is profusely illustrated describes the water gardens of California Trimming atroct and lawn trees a timely subject is well treated by an experienced writer. The historic maneious of the Rap sannock River are always interesting and the illus trations of Kenmore the home of Betty Washington one of the important features of this numbe

The Current Supplement nations in unusual number of thinly and interesting article 2 or these days the current Supplement nations in unusual number of thinly and interesting article 2 or these days the sun were extinguished? He considers be preblem noon instructively Prof 0 N with the distinguished German chemist contributes an article on the development of technological chemistry distinct the last forty years An abstract 3 published from a raper read basic the Supplement of the Control of Util Engineers by M Georges Chands on some interesting infusirials and published and the Control of Util Engineers by M Georges Chands on some interesting infusirials and published and processes in generation at the Unable-"seemity being to be the companies of liquid six and coverage an accordance of liquid six and coverage and control of the cont

#### Correspondence.

EOW TO MAKE THE 'ALABAMA AND MAINE"

To the Editor of the Scientific American
As a reader of the Scientific American I am par ticularly interested in the articles on the

velopment

I wish to know through your paper why the follow
ing changes would not be practical in remodeling the
battleships Idaho and Mississippi Bearing in mind

that unless whether any opportunity removering the state of the state it crease but enough to allow these ships to steam with the 18 knot toutstana class without reducing the speed of the whole first to 17 knots I would replace the Sirch guns with four 10-inch 4 caliber guns and add two 7 inch and four 3 inch guns to their present batteries Thus we would have the following results

length 375 feet to 405 fee Beam 77 feet to about Displacement 14 000 tons to about 78½ feet 14 500 tons Horse; w r 10 100 to about Bj eed 17 knots to about 15 000 H P 1814 Irnote Bunker at a fig 170 t us to slout 2100 tons Rattery 4 12 in 1 4 10 in h 10 7 in 1 and 16 3 inch

The armer to remain the same as originally

This would be a rather costly change but when This would be a naturer costly (nange out wann a warshi is need of the xpense is a small item and it ese two ships with the increased speed and heavy batteries would be a welcome addition to our first line. of pre-dreadnoughts Chicago III

Such hanges as ar suggested by our correspond ent would be to costly for the benefits secured it would not be possible to hankall four 10 fact guage-the weights of guns ture to ack would be prohibitive to catterly new ships of the dreadnought class—Enj

Beath of Prof Amos B Belbear Prof Dolbear died at Bedford Mass on February ird at the agr of seventy four He was widely home as an inventor of circircial devices Perhaps his in vestigations in wireless telegraphy brought him more into public prominence than any other but the result was an infringement suit in which he unsuccessfully sought to restrain Marconi from continuing his experi

Prof Dolbear took the degree of BA at Wesleys Prof Dolbear took the degree of BA at Wesleyan Interrety in 1686 and the degrees of MA and MB at the Lutventity of Michigan in 1887 From 1886 to 60 Michigan Theo be evolved the thair of Assistant Professor of Natural History at the University of Kar-tuky from 1867 to 1886 Fran 1888 to 1874 he was Professor of Physics and Chemistry at Berhamy W Ay From 1874 to the time of his death he was Profers r of Physics and Astronomy at Tufts College His scientific investigations included the study of light this attention investigations included the study of the other and electrical phenomena the properties of the ethe magnetic telephony stati telephony heavy curve ammeters cables for telegraphi and telephonic wireless telegraphy and ? oropicities of matter

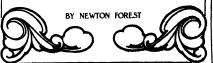
#### ( omet 2 1910

and Dec +7 deg " min

According to Electrical Engineering a definite proposal has been put forward for the construction of a tunnel between Dennark and Sweden starting at Copenhagen and connecting up with Malone (connection would be made on the way with the small islands of Amager and Sahtholm and the electric trains which it is proposed to work through the tunnel would was on the surface on these islands in order to reduce the underground (porary as much as possible. If the absent is curried out it is estimated that the trag could be made in 1% hours.



# OSTRICH FARMING AS AN **INDUSTRY**





Boes estrich farming pay? The question is asked by almost everyone who visits an ostrich farm. The control of t answer is that when an acre of alfaifa will furnish a for four birds with food enough to maintain ions for four birds with food enough to mannam them throughout the year when an oatrick will yield annually about two pounds of feathers with an aver age value of \$20 a pound and from thirty six to ninety eggs which may be used for incubation or may fur-nish food at the rate of meanly four pounds to the eggs

num roos at the ratt of marry four potunes to the eag if the owner does not wish to increase his troop estricto farming does pay and pays well. There is nothing very lovable about an estrich a there usually is about other domestic animals. But however lacking in personal charm it may be the big bird is a money producer A head of cattle eats sixty bird is a monty producer. A need or cattle east sixty five pounds of allafa in a day an outrich it on pounds. This head of cattle at five years old is worth \$10 and an outrich at that age is wonth \$2°0. There is nothing to the cattle but ment. At ten months the outrich will produce \$10 worth of feathers and therafter from \$25 to \$10° worth of feathers and therafter from \$25 to \$10° worth of feathers annually for a long acted of years. However, we catch he manufact at the period of years | I hough an ostrich is matured at the age of five and is reproducing its average life is about that of a human being. The bird does not be gin to decline until it is fifty years old. Many how ever produce fine ; lumage at the age of a venty five

There is as much difference a the breed of estriches as there is in any other animal. Some of the (all rais and Arisons male birds are rated at as high as \$7 000 each but ordinarily the value averages about \$400 for a creveroid lird and about \$100 for a chick Some of the cocks weigh as much as [00 pounds and stand over ten feet high

It has of late years been found that a great deal money can be made in ostrich farming Especially so where alfalfa or lucern can be raised on irrigated lands In the Sait River Valley in Arizona there are about 2 0 00t acres of rich land soon to be made richer and more productive through immense irriga-tion works on which the United States is spending \$6,000,000 Such a climate is an ideal one for outrich farming as the farms in that locality have proven by their successful operations. While the birds theirs best in a warm dry climate they can be grown in any of the southern States and Territories of this country in a moist climate however they would have to be protected from cold and rain

only a little more than two decades ago since the first outri her were brought into the United States with the serious purpose of attempting their culture here Before that time the only birds seen in this country had been adjuncts to circuses To-day as cleates of those in zoos there are some four thousand birds on the American continent. Probably half of this number are the progeny of a single pair owned to Arlana in 1891

The female os cock beginning to lay fertile eggs when she is about three and a half years old. The next is nothing more or less than a bole scratched in the ground which is done by the male bird At first the hen may not take to the nest but may lay her first eggs on the ground whereupon the male will roll them into the nest Generally after the male has put three or four eggs into the nest the female will take to it. She will then lay an egg every other day until about sixteen then isy an egg every other day until about sixteen eggs have appeared in the next An entrich egg is neatly eight inches long and about six inches in di ameter it makes a good omslet and is arcellient when scrambled. One egg will make as much omelet as three dozen hens eggs! A full-grown bird has been known to produce over three hundred pounds of egg food in a year

An annual increase of about fifty per cent of a flock

is secured mainly through the use of incubate though on every farm a few paddocks are maintain ca h for the sole occupancy of a pair of birds. Three times a year the hen begins to lay. She does most of times a year the hen begins to lay. She does most of ber setting during the daytime the made bird attend-ing to that part of the household duttes at night. He will usually go on the next about five celock in the evening and remain there until eight oclock next morning. It is thought that the celor of the same has something to do with developing these instincts. The made heline black for nor analyse same with the something to do with developing these instincts. The main being black is not so easily seen at night and the fensale being drah or nearly the color of sand annot be readily observed on the nact in daytime. The male usually begins to sit three or four days he-fore the hen stops laying. If the weather is cold dur-ing the laying period the main will often be found ov-ring the eggs at a thrawful during the night to prevent coming chilled The birds are als them from becoming critical into the same was very watchful in the warmest season to prevent the eggs from becoming superheated by the sun. The birds do this by resting on their ankle joints and spreading their wings umbrells wise over the nest. As is usually the case with all eggs in a dry climate the shell of an estrich egg becomes dry and hard. It is therefore very difficult for the chick to break through. When the time arrives for the liberation of the young they

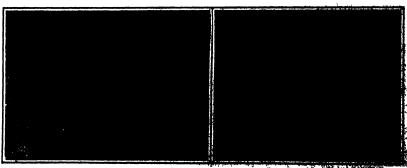
are heard to chirp and to move he the shell, This phreat bird seems to understand the climition, and will often create the shells with he headshoot, some-times taking the young by the head and polling it out the shell. Sometimes there or five days despite be-tween the hatching of the first and the heat egg Thy-ing this time one of the parent interes sixten to the next while the other takes care of the chicks. However on while the other takes care of the chicks Rowwess on a well required out the form the farmor assists the birds in lataching by creating the eggs with a small belower and putting the unhalteded eggs its on at low-

they first come out of the shells yet their hodist are as large as those of full-grown hear. They are as fussy and as soft as a day-old chicken but far more

fung and as soft as a day-old obliven but her more stupid. For the first week of their existence nothing but gravel is given the young ostrobes. Then they are turned into manil poss in the alritals lots where they are to set affaith for the rest of their lives. Plooting it the general term by which the harvest-ing of feathers is known. The term might issed one to believe that the feathers are pulled out. This is not the once however for that would injure the bird. The plumes are snipped off with shears close to the feath. The quills that are left soon die and drop out such The quilts that are left soon its and drop out fare which me whaters before to sprout There are treatly after long white plumes on each wing of the cook bird The reat of the plumes in black on the male and of a grayisk color on the female. Gathering the batthers is no easy task. This work has to be done with great care for a lick from one of the powerful legs of the bird is enough to disable a mas for life or even kill him outright.

At the plucking time the birds are driven into insignificant power of the state of the control of the powerful below the product of the powerful below the product of the powerful below the control of the powerful below the powerful bel

The first experiment of ostrich farming in this The first experiment of out-the favoring in this count try was made by an Ragillamma who imported his birds from Africa and paid as high as \$1.30 a, pair from Africa and paid as high as \$1.30 a, pair from Africa and paid as high as \$1.30 a, pair from the Africa and Africa and Africa of the Africa and Africa



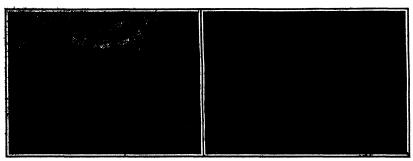
A male chick just batched by an insubster

Berning in prince, No. 12, 12

The property of the property. But no formation of the property of the property

operation in done by French girls, and the skill with which this work is edurated on is marvelous. To each fine on a long plume is thet another is such a way that the joint is invisible frome plumes treated in this manner have been priced at \$1000

Mektron Metals a New Light Weight Alley At the international Aeronautical Exposition in Frankfort a Griesheim firm exhibited a new and The field of userlyiness of the new material, there, is very extensive lies strength and lightness makes it especially valuable for the construction of arbit and assophane, but it may also be employed with advantage in the construction of automobiles motors, and machiness and instruments of every kind it is so allow that the construction of automobiles motors, and machiness and instruments or every kind it is so along that 40 pounds of these materials. For example in a 7-specific pounds of those materials, For example in a 7-specific materials.



An article design and

A pair of birds and their eggs

The business of opticit, furning has long become a seisone before it was introduced into this country. In South Africa there are all manner of laws to proceed the business. There is a provenmental outrich dector whose gardenized only it is to study the discase peculiar to such birds. There is also an other breading association where are recorded the pedigrees of the lines bride flows of the firmers have so to growed their stock that thatr outrich childs bring from \$600 to \$1.000 seeks and many of the most needs out.

eages peculiar to such birds. There is also an outrieve breating association where are recorded the policy of the finer birds. Some of the farmers have so in prevent their stock that that outrieve hickes bring from 8800 to \$1.000 seech and many of the most noted cock birds are priced at \$1.000. Pierr Situation in South Africa is the chief outrieve fasther port of the world. In that 'giphility there are nearly a half million birds now in highlyitity. The fusthers from these birds self from \$15 to \$150 a possed and the industry of this one port sions amounts to some \$15.000 000 a year.

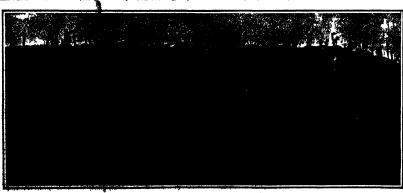
possed must the monthly to some \$15 000 000 a year.

There are some districts that produce Setter feathers than others. The Outlishoorn feather naches twanty

patential alloy or series of alloys under the name electron metal. These alloys possess great strength united to exceedingly low specific gravity and hence appear to be the material of the future for various structural purposes. Aluminium and its alloys the lightest metals now used in parelic, are 8 ty per cont heavier than elektron metal and far instructural cashings of which metal have been very greatly in neither of magnesium the rather inferior structural cashings of which metal have been very greatly in proved by additions of various other metals. The alloys vary in specific gravity from 175 to 30 possess great strength tenucly and elasticity and are easily worked. They have a clear metallic ring and when polithed a beautiful altivery inviter. Their resistance to atmospheric infinences satisface every practical retined of the provided of the strength of the form of castings they show a tractile strength up to

sirably having an aluminium frame weighing 13000 pounds 4000 pounds weight could be saved which any reduction of strength by the substitution of elself tron metal it would then be possible to carry more fuel and hallast increasing the radius of action more passengers or larger and more powerful motors. It may even be found possible to diminish the dimensioned the sitesball and the cost of operating it by an extremive employment of the new material. Similar at which the complex of the contract of the sitesball of the contract of the cont

The consumption of pulp wood during 1908 by 251 pulp mills in the United States amounted according to a preliminary report of the Bureau of the Census



The value of the 110 birds in this picture is at least \$50,000.

#### QUEENE PARKUR AS AN ENDOTTE

more than 25 000 pounds per gegars inch and an electricisticity up to 5 per onts. By pleasing religion and derecting, the tractic strength on the piecewase to see the castendard type of the castendard type

to 3246 106 cords of wood which furnished 2118 947 tons of pulp Nearly 11% million cords of domestic and over 670,000 cords of imported spris e were con sumed Next in order is demestic hemick of which 69173 cords were converted into puly More than 800000 cords of poplar ways ent isat year mostly from domestic things. The remainder of the limber about 19 per cest, was chiefly supplied by pine cottonwood, and balanam

## THE HEAVENS IN MARCH



S the year advances, there a temporary break in the of comctary phenom ona which make the first half of 1410 so not worthy fine an object at the end of Lemany, came almost to test among the stars early in Pobrumy moving sime

straight away from the earth and rapidly losing bright so regain away room on carri and rapany iosing bright nose. By this time it is unobscrable, bolind the sun and some distance north of the cellptic. In another month or so it should be seen in the morning sky, but

only with telescopic sid.

The determination of its orbit has apparently prosented unusual difficulties. In order to calculate a comet's orbit, we must first have accurate observations of the position. Such observations are usually made by measuring with the telescope the distance and direct tion of the comet (or equivalent quantities) from some star whose place in the sky is known from pretions observations taking care to note the time at which these measures were made. In the present case the comet was at first

tistick only in daylight, when no suitable 'com parison stars' could be seen its position in the sky had therefore to bo found by means of the readings of the graduated circles attached to the tele mon, and these are far inferior in accuracy to measures of the former kind

it is not therefore sur prising that the prelimi from these rough observathemselves. When the comet reappears in the morning sky, and can be accurately observed, the comparison of the results with the few accurate observations made in Janu ary and February will set

tle the question Halley's comet is also out of sight for the pres ent-behind the sun nearly so and about 175 million miles away may still be observed telo deally low in the west in the early evening for a few days carly in the month, but it cannot be seen in the morning sky until April is well beguff, when it will reappear much marer us and prob ably far brighter than when it vanished in the twilight

We must therefore for the time being turn our attention mainly stars, and among them we will find much to occupy us while we walt for the

comet to reappear. Let us begin right overhead with the constellation Gemini its two principal stars Cas-tor and Pollux, idustify it at once, for nowhere in our skies are two equally bright stars as near neighbors The roughly parallel lines of stars which run south west from these and terminate in the stars  $\gamma$  and  $\eta$ 

are also easy to identify if once learned
Castor itself is a fine object with even a small telescope, showing double with a power of fifty diameters.
The two components, one about twice as bright as the other revolve about one another with a period of per-haps 400 years. The faint star which lies about twelve times as far from them as they are from one another is moving with them among the other stars, and is probably also in vity slow revolution about them but, if so must take more than ten thousand years to complete in single circuit. The star 3 is also a fine double. Clother but the manual is 2 is also a fine double. complete a single circuit The siar 8 is also a fine double Close by to the canward in Cancer, with no bright stars but one interesting cluster, visible clearly to the naked eye, and resolved into its separate stars by a field glass. This spot of light known as Praceeps (the Beobive), is marked on the map Auriga, which lies in the Milky Way, northwest of

the senith, is one of the finest constilations in the sky The figure of the charloteer kneeling in his charlot forms our initial letter. The most northerly

#### Scientific American

bright star of the constellation,  $\delta$ , is in his head,  $\beta$  is in his right arm, and the brilliant yellow star (aprila (a) marks the Gost which he is supposed to hold in his left arm, while the three smaller stars just below it are called the kids—an armful indeed. Farther south # is in his right knee, and , in of foot, uncomfortably near the tip of one of the Bulls horns (# Tauri)

Capella is, next to Sirius, the brightest star in the part of the skies which we can see-secording to the data of the Nautical Almanac Arcturus and Vega are however very nearly its equal in brightness, and the three stars differ so widely in color that different observers, whose eyes were unequally sensitive to light of different colors, might easily disagree as to their relative rank Well down in the west are Orion and his neighbors, Canis Major on the left and Taurus on rough the latter Mars passes th the right Mars passes through the latter consisting tion during the month, and fairly rivals Aldebaran in color and brightness. Perseus and Andromeda are in the northwest—the latter partly set—and Cassiopela farther to the left

Farther to the left.

Due south we see Procyon, with the few faint attendants which are supposed to resemble the Little
Dog, high up near the meridian, and part of the great
constellation Argo low on the horizon Farthor east,

right of the pole, Urus Minor, inclease within its aweep; and Copheus, low in the north, complete our

Mercury is morning star gli through March, but, being south of the sun, is not well observable in these latitudes. He may perhaps be seen early in the month, but only with difficulty, as he rises but three-quarters of an hour before the sun.

Venus is likewise a morning star, and, unlike Mor

cury, is very comen

She reaches her greatest brightness on the 18th.
At this time she appears, with a magnifying power of
fitty diameters, just as the creacent moon some five days old does to the naked eye, except that her surface is free from perceptible markings, and uniformly white. She rises about 4 A M and is the principal white, she rises about 4 A m and is the principal ornament of the morning sky Indeed, there is a difficulty about seeing her in broad daylight—if the sky is really clear—except that of knowing where to look for her On the morning of the 18th the cresm will be a good guide, as Venus will lie about five or six degrees nearer the sun, and about two degrees above the line joining them Mars is still an evening star, but is steadily losing

brightness. His distance from us incr

to 170 million miles during the month, and he moves eastward among the stars through Te stars through Taurus, keeping well shead of the sun, so that he remains in sight till after 11 P M

Jupiter is in opposition on the 31st, and is visible all night long. He is a splendid object to the naked eye, and a fascinat ing one in even the small est telescope. His four large satellites can be seen without difficulty, unless indeed some of them should be behind or in front of the planet. In the latter case their shad ows can be seen, as black dots on Juniter's surface with more powerful in-struments, and afford one of the most interesting of celestial spectacles as they transit across his disk The elliptical form of the

planet due to his rapid ro-tation, and the dark belts which cross his disk, parallel to his equator, can also be seen with a small instrument The four other satellites, discovered in recent years, are observable only with a few of the largest tele-

ropes. Saturn is an evening star, setting about 8 P M in the middle of the month Uranus is in Sa gittarius, rising about 3 30 A. M. at the same date Neptune is well observable in Gemini, his position on the 15th being R. A. 7 h 11 m 35 s., Dec

M. A. 7 h 11 m 35 s., Dec 21 deg. 44 min north, and his apparent motion very slow To identify him, how-over, one needs either a detailed star map or a tele-scope large enough to show his disk, that is, six inches

scope large enough to show any unes, unessent or so in apportune or so on the 9th Saturn on the 18th, Mercury on the 9th Saturn on the 18th, Mars on the 18th, Neptune on the 19th, and Jupiter early on the mornonly the last conjunction being at all

At 7 A M. on March 21st the sun c At I A M. on march But the SUN crosses the celle thal equator, passing over the point in the heaven called the vernal equitor, or "first point of Aries," and in simmans 'huguwage "Spring countiences." Princeton University Observatory



NIGHT SKY: FEBRUARY AND MARCH

on a level with Protyon, a small but conspicuous group marks the head of the great serpent Hydra, whose body may be followed, past the lonely red star Al phard, down to the southeastern horizon. To the left rvus and Crater, and then Virgo m usually brilliant by the presence of Jupiter, which is just below the notable double star ? Higher up is Leo, one of the finer constellations, recognized at once by the 'Sickie,' at the end of whose handle is the first-magnitude star Regulus.

Farther west, near the horison, Arcturus shines brilliantly, far surpassing his neighbors in Boötes. Above and on the left is the familiar and gigantic form of the Great Bear Within the curve of the turm of the Great Bear within the curve of the Bear's tail (the Dipper handle) are the Hunting Dogs which pursue her on an endless chase around the pole They have but a single bright star, but this is a fine double, worth looking at if one has a telescope magnifying twenty times or more

The group of small stars known as Berenica's Hair, to the southward, is a good example of a star cluster so coarse that it can be resolved by the naked eye, but yet composed of stars faint enough, and near enough together, to produce almost the impression of a nebula at a hasty glance, while closer service shows the individual components. Draho, counting up out the

Gitting Glass or Processin.—Prepare a mixture of 900 parts of lavender cit. 100 parts of gold chierids. 5 parts of lavender cit. 100 parts of gold chierids. 5 parts of lavender cit. 100 parts of gold chierids. 5 parts of lavender lavender control of chierids. 5 parts of lavender cit. 100 parts of lavender cit. 5 parts of lavender cit. 100 part

#### BULLET'S FLIGHT THE

# SOME NEWLY DISCOVERED ERRORS IN TARGET SHOOTING lines and screens enabled the author to follow the course of each bullet, and the acreens were spaced at distances along the range to match the typeriment in hand A distance of three feet spart was sufficient for

in the face of many excuses, it is a recognized fact that the bullet from a rifle seldom strikes the target where the marksman would like to bave it strike The constant endeavor for years, in all countries, has

been to perfect its errors at the target. Unmoney have been ded in these dorts. According to the author of the book which ites before us, an author who speaks with a conviction gained from years of pa tion the innum able causes of in accurate rife ting, many of which have been known for a long time, may be divided into two great clauses

frui those inhe-

Ø. A STATE OF THE STA 

Fig. 2 -- 01 monestric action. Fig. 3.—How the conter of gravity of an unbalanced built and at the mussis, it takes a straight flight as represented by the tangent of

Machine rest target shooting to detect errors in rifle and bullet

those which are external to it. His experimenting and hence his discussion deals exclusively with the errors adherent to the rifle and oxitaited with the errors adherent to the rife and ammunition, and does not consider any of those be-longing to the second class, such as all currents, per-sonal elements of the shooter, bumidity of the sir, or any error in siming the rife. Years of careful ma-thies-rost shooting and the experience of thoughtful rifemen point clearly to the fact that, whom all the elements of the second class are excluded, the rife customerits or the second class are excluded, the rife and its ammunition produce a regular and ever-pres-ent error at the target which has not yet been over-come. To determine the nature of that error is the

rent in the rifle and its ammunition, and secondly,

come to teterature the action of the determinant author's primary purpose.

The cause of this ever spreading of shots he has operimentally disclosed, with the result that the rifleman knows better than he ever did hefore, the defects of rifls and bullets. The book teaches us how to eliminate the errors of the rifls and its ammunition, and w which elements of the cause for such errors cannot be overcome by human skill, thus allo to proceed intelligently rather than under old meth

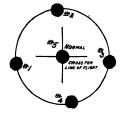
sethed and apparatus to bring out these hither to undiscovered errors are fully sot forth, illustrated, and explained. The system of investigation adopted was based on the principle of exclusion, that is, the when cased on the principle of exclusion, that is, the personal element, movement of the air, mirage, and faulty aiming were eliminated. Covering as it does the work of years, the book is commendably exhaustive

ring 1901 a suitable machine rest, differing ma During 1901 a suitable machine rest, canoring ma-terially from anything before produced, was made as bere illustrated (Fig 1) It was built of concrete, and was permanently rigid Upon it a bronch v three feet long was securely boiled. The barrel of the rifle, stripped of its normal action and wooden stock, was mounted in aluminium riggs, one for the muscle and one at breech, and, thus surrounded, was held in its normal position in the bronse V, which was accurately machined. A concentric action, as shown by illustra tion (Fig. 2), took the place of the normal rifle action completing this part of the outfit The line of fire remained the same from day to day and from year

Between the rifle's musile and target, paper screens

were placed, through which the bullet passed in its flight. A perpendicular line through the perpendicular line through the center of each screen, by the aid of telescope and cross hairs, was hrought into exact line of the V rest, which was also the line of fire of the rife barrel which lay upon it. This arrangement of

\* The Bullet's Pright from Pewder to Tar pt. The internal and external bullistics of The internal said external buildness or spail gress. A study of title shouther with the purious joinous excluded, districting the name of the error at the target. Heatstand with the plates, through the restate of even and the plates, through the restate of even horsing the statile of ever sir justicesed and choose i, My F. W. Moon, B.S.



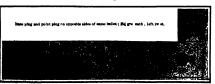
Only one built hit the mark (center) slithough all were fired une exactly the same conditions. The picture shows the X orror at 14 feet from the muzzle

Fig. 4 - Five bullets fired from a fixed rest.



This took the place of the normal rife action, the line of fire restateing the same year in and year out.

Fig. 5.-Riements of the eshown in Fig 2.



the upon at upon left acres where a true bullet points to number I and I bullet holes is did inches and life years. The arrest receives at distances from the manue store that No. I shot lack an I wrow. A like a fire where the contract the contract is the contract that we have the core where the core is the contract the core is the core of the core.

Fig. 6.-- Forgor at 200 yes "Lastrated by actual target made by two unbalanced bullets. THE RELATE VANCE . MAIN PRIVAT RECOVERED RESORS IN TARGET SECOTING.

testing some of the curves which the bullet made, but in many experiments it was found necessary to place the screens from six to three inches apart to register the bullet's motion Day by day facts were accumu-lated, and at the

end of several years the au could so place these screens that any desired infor mation respect ing the bullet's motions could be expeditiously ob-tained, one irregularity after another being eliminated to that end

As is often case in all scien preconcuived ideas of the bul let's action proved to be more or less incorrect. and

the one to which it seemed all continuous must be made to bend, was found to be absolutely incorret. This idea, that the builted during its passage through the rife must and did fly in a straight line with the box, and the afterness. the rine must and did ny in a straight line with he bor, and that afterward it changed its direction to fly away from the mark, held the author back from the real fact for years. Streens placed at one two, or three fort from the mustle showed indisputably that an unbalanced bullet left the line of fire, or line of the bore, immediately upon its exit therefrom, and the cause of this was a very astounding discovery to make

It is easily understood that the center of gravity of an unbalanced bullet is not in its center of form, and therefore not in center of the rifle bore. Due to the twist in all modern rifles, this unbalanced bullet rotates during its passage to the muxie and carries its center of gravity in a spiral around the straight line forming the center of the bore, and also carries line forming the center of the bore, and also carries the event of grawthy around the center of form of the bullet itself in mechanics and especially in bulling the control of the bullet itself in mechanics and especially in bulling the control of the control of the control of gravity tavols. Hence the unbalanced bullet (all bullets being more or leading method to the control of the control of

When the projectile is liberated at the muzzle, no longer forced to make a spiral flight, it immedia takes up a straight flight, which it must do according to the fixed laws of inertia. This straight line, however is a continuation of the flight which the bullet was making as it left the muzzle not the line of bors, but a tangent to the spiral which the projectile described in the bore as represented though grossly ex aggerated, by the spiral as and its tangent a or ee in

Fig 3 exaggerates and makes clear how the center of gravity of an unbalanced bulkt moves in a spiral form within the bore, but how when liberated at form within the bort, but now with interact at the muzic, it takes a straight flight, as represented by the tangent at the right extrainty of the spiral in the direction of a No possible power at the muzic could make it take the direction of bore as represented by d.d., without districterating the built. Thus the bul let, instead of flying straight in the rife bore as every one supposed, and making some change in its direction afterward, in reality flies in a spiral during its pas-

y files in a spiral during its pas-sage to the muzzle, and does not change its direction at the muzzle, because there is nothing there so to change it. This is the longsearched for cause of error at the

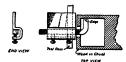
target The presence of this error, called the "X error" by the author, was clearly demonstrated in thor, was clearly demonstrated in screen shooting by R A Leopold of Norristown, Pa a number of years ago, and the apparent change of direction in the flight of a bullet at the muzzi, was known in an indefinite manner to various riflemen Their attempts to overcome it, and the theory upon which these attempts we (Continued on page 210.)



#### TOOL-HOLDING DEVICE FOR WOOD TURNING

BY CHAUNCES IN MIRRAR

those who use a wood lathe find frequent occasion to make special tools for difficult or unusual work, and when the tool is so shaped that the cutting edge and with the fool is so shaped that the cutting edge is at right angles to the shank, great annoyance is gaperienced in holding the tool to the work, and keeping it from turning in the hand Recently I had



TOOL-HOLDING DEVICE FOR WOOD TURNING

a piece of work similar to that shown in the drawing and after many expedients had failed to give complete entinfaction I developed the device illustrated ratisfaction I developed in device mustrated it is prade of heavy sheet storl (the heaviest I could work cash) and provided with two setserows, as shown, to allow it to be moved along the chised as desired, and for the insertion of new chisels As flustrated, the flat portion lies on the tool rest, and this absolute. lutely prevents the turning of the tool. By its use I was able to reach with ease the most inaccessible

## ELECTRIC INCURATORS AND RECORDED

The advantages of an electrically heated incubator over those making use of kerosane lamps and the like are so great, that as rapidly as cheap reliable power a rvite becomes extended throughout the country, the hatching of eggs by electricity blds fair to displace all

other methods.

An electric incubator can be built at home by anybody who can make a wooden box and connect up
ordinary incandessent lamps. Such a machine has
not only the merit of being low in first cost, but of
having nothing about it to wear out, and of being capable of giving perfect results with very little atten tion on the part of the operator

tion on the part of the operator. The photographs show the first incubator built by The photographs show the first incubator built by the photograph of the photographs of the photograp

The boxes should be made of well-seasoned lumb bout 'y inch thick. Old soap boxes furnish goo Old soap boxes furnish good

about is inch thick material for the nurnoso For a fifty-egg machine the inner box needs to be it inches wide, 17 inches long, and inches deep, all inside meas urements This box is to be left without any top or bottom ( reept a statted botton which is to be put in half way down

thus dividing the hox into an upper and a lower compartment of equal depth. On top of the slats a double thickness of woolen blanket should be tacked, to support the eggs, as shown in Fig 1

Eight chetric lamps are required for the heating Eight Circitic lumps are required for the heating units These are best mounted in percelain recep-tacles as shown, four lamps in each compartment near its top. For 110-volt circuits uses ordinary 16-can dic-power earbon filament lamps made for 230 volts, and connect them as shown in the diagram, where *REG* means regulator, or thermostat and *RB* are snap switches to be placed on the outside, as shown in one

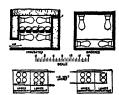
It is hardly worth while to make a thormones, as unitable for the purpose can be bengath from a dealer in electrical supplies for about serenty-recursit, but its not a difficult job for anybody who takes pleasure in defing such work. Fig. 2 shows a relative for the other means training the work of the property of the a thermostat at ose can be bought come next. The strips should be about 1/32 inch thick, 8 inches long, 1 inch wide at the large end end raice, a incass long, I inch winds at the large end and 3/8 inch at the narrow end They may be fast cool together with fifteen or twenty small rivets, or by soldering them all around the edges. The two metals thus joined tend to curl and uncur! with changes in temperature, by reason of their different rates of expansion. The large end should be clamped to a block, B, as shown, and a contact screw should be to a block, B, as abown, and a contact screw should be provided at C, with a sitt wire, D, attached to serve as a screwdriver for adjustment from the outside it is highly important that the up of 30s crew C and the spot on the size (or brase) strip be protected by pierce of pistum soldered on, or the electric are which appears between them will soon destroy than the thermostant be purchased as advised, it much account to the contract of the service of the contract of the mounted in such a position that the adjusting screw on he results the presentative services.

can be reached by a screwdriver or wire passing in from the outside through small holes in the bores. The inner and outer boxes are to be joined at ligh-loruning a doorway or tunnel three inches high-forming a doorway through which chicks may enter the brooding compartment under the egg chamber The inner and outer boxes are to be joined near the top by three or four half inch tubes for ventilation

as shown at V, Fig 2

The top of the egg chamber is best covered over with a pane of glass, on top of which is laid a small pillow or several thicknesses of folded blanket.

Next in importance to the thermostat comes the noice of a thermometer and its proper location in



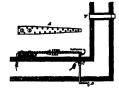
R 1.—COMBTRUCTIONAL DETAILS AND WIRING PLAGRAM OF THE INCURATOR AND RECORDER.

the egg chamber, where the bulb should occupy a trai position rather than one near a corner it is not necessary to buy an expensive instrument in order to get accuracy, an ordinary tencent thermometer can be made to serve the purpose very well provided that its scale be properly corrected or 'calibrated' This may be easily accomplished by taking advantage of the fact that the internal temperature of a normal, seathly person is just a trifle over 98 deg. Tie a thread around the tube at the place marked 98 deg on the scale, and remove the tube from the scale, to which it is usually attached by two bits of wire. Place

eight issues in see, the apparatus as described is capable of maintaining a temperature of 164 dag, fat the egg chamber when the room temperature is due 40 dag. If used in a warmer room, one pair of the lamps in the lower compartment may be turned of ans of the snap switch a pair of \$80-volt 16-candle-power cart

MARKE & MIRE

Buch pair of \$80-roit 15-candispower carbon haspa; connected in series as shown, will, when used on a 15-roit circuit, burn with a dull red give accordy reights in daylight, and with a power consumption of 5% in daylight, and with a power consumption of 5% the temperature is 85 deg, commune about 14 water, making a total for 25 days of about 2 bilowatt butter, which, where the rate is 10 cents, costs 80 cents. This cost tooks high at first sight, but it is materially lower than that of a herosmo-burning machine if one stops to consider he saving in literate on first investment,



Pig S.—METROD OF APPLYING THE THERMOSTAY.

the saving in oil, the absence of depreciation and pair bills, and the saving in labor of attendance.
In the practical operation of the incubator, the following points should be borne in mind

The eggs need to be turned partly over every day A ood way to do this is to take out the row of five eggs at the left hand, end, roll the remaining ones toward the left, and replace the five at the right-hand end This progressive morament zerves also to seen up the different times of hatching that might result from

different times of narrang that many result has some eggs remaining in warmer spot than others increasing ventilation is required as incubation progresses Practically no air is needed the first two veeks, and all ventilating tubes and the door to the lower compariment may be kept closed with comaiderable economy in power During the third week, and especially when the hatch is due, plenty of air must be allowed to filter up through the eggs, as shown by the arrows in Fig 1

No moisture is required during the first week

Thereafter it is best to keep a small pan of water in the lower compartment and a small glassful in the ogg chamber These serve to prevent excessive evaporation of the eggs by too dry air

The newly hatched chicks should not be taken out or fed until they are 24 hours old After this they may be kept in the lower compartment for a time, provided all four lamps be kept burning. As soon as convenient, however, they should be transferred to an convenient, however, they should be transferred to an electric brooder, two forms of which will now be de-

The first and simpler form, suitable for use only in a well warmed room, is shown in one of the photo-graphs. It consists of a small wooden table carrying arapha. It consists of a small wooden table carrying on its under side four lamps, and surrounded by a fringe made by slitting a piece of old blanket. For use on the ground or where the floor is not warm, bottom heat must be provided as shown in Fig. 1. Forty tom heat must be provided as shown in Fig. 1. Forty childs can be accepted to the state of the s

by such a br ing din g. Botte tin 14 by 30 in es, protected on top by a sheet of

Top, 14 by \$6 inches, supported by legs 8 inches er pox of wood, 14 by 20 da, 2

paper as sprinkling of sand Four lamps are required the upper part, one near each corner, and in the bottom heater it will be observed in-diagram of connections that the latter lamps connected in parallel and not in series, which can them to have more briefly the two them to burn more brightly. The newer constants as water, or about twice what is required for ing. No thermostat or thermometer is needed it It will not get too warm if the en

brooms it will not get too years at the coarse lieft on all the time.

Where any form of hotting house, much of the described, is meet it to pleasantly the described of the des



INCURATOR WITH BROODING COMPARTMENT OPEN.

the bulb under the tongue at the side of the mou and hold it until the mercury column does not rise and hold it until the mercury column does not rise any higher. By observing with a mirror it will then be possible to determine quite accuration, how minch in error the marking on the scale may be, had due allowance for this can then be made by assuming that the same error is present at the 104-deg. mark, is the temperature of incubation.

The machine must be run a few days before any regs are put in, to give time for carefully adjusting the thormostat. When the latter is once set right it will actionatedly maintain the heat at the design point by "winking" the heaps be and off. With all

If which the chicks may get up on the raised platform. The following bill gives a list of all materials need-

| and their present retail prices.        |        |
|---|--------|
| For the Incubator                       |        |
| 8 230-volt 16-candle-power carbon lamps | \$1.60 |
| 8 percelain receptacles                 | .48    |
| 1 thermostat                            | 75     |
| 1 thermometer                           | .10    |
| 2 single-pole anap switches             | .80    |
| 1 piece 13 x 18 window glass            | .20    |
| Lumber, etc                             | .18    |
|   |        |
| Total                                   | \$3.58 |
| For the Brooder.                        |        |
| 6 230-volt 16-candle-power carbon lamps | \$1.20 |
| 6 porcelain receptacles                 | .26    |
| 1 sheet 14 x 20 tln                     | .15    |
| Lumber, etc                             | 95     |
|   |        |
|   |        |

The foregoing bill does not include the shaded lamp and fixtures shown on the outside of the incubator in Figs. 1 and 2 An ordinary 4-candle-power lamp so venience, but not in any way essential

#### COMPRESENT DOOR HOLDER.

A convenient door holder may be made from a

a convenient coor holder may be made from a barrel hoop, as shown in the accompanying illustra-tions, by cutting a place about eight inches long and inserting a rubber-head tack (such as used in the plumbing trade) at each end, on the under side, as shown in Fig 3 Two such tacks are also placed on shown in Fig. 3. Two such tacks are also placed on upper face, speed apart sufficiently to allow the bottom of the door to fit between them. The archied shape of the hope will give sufficient irritation between the door and foor to hold the door in any desired position. If robber-head tacks are not available the ends may be covered with some soft material such as carrier and tacked thereto. In place of tacks, a notich may be cut in the barrel hoop equal to the thickness of the door as above, in 1864 of the Ulinarization.

door, as shown in Fig. 4 of the illustration. The



center of a barrel stave may be used instead of a hoop by cutting it to about the same width as the hoop

## BORING MOLES IN GLASS.

ersally conceded to be exceedingly diffi cult to work when cold, yet its fragile nature often calt to work when cold, yet its fragile nature often calls for means of repair it it is also desirable some-times to drill large holes in giase plate, or through a glass column, which is not an easy thing to do with any facilities hitherto developed for such work. It is well known that turpestine applied to a small drill will enable one to drill through a piece of glass

drill will enable one to drill through a piece of giase by parasisate application and frequent grindings of the drill. This hele will often taper from a large diameter at the top to a smaller one at the bottom, and busides it is quite impossible to drill two boles of the anne size with the same drill. Instrument, work of certain classes would be made better also if it were possible to an phreads in the gians at which the see other parts are composed. In the opinion of the possible to tap threads in the glass or which the loss or other parts are composed. In the opinion of the writer the best fluid to be applied to the glass so that the tool will take hold is that of the formula given below. It has been developed after many experiments with different mixtures, and will be found to be au

with different mixtures and will be found to be un-perfor in anything heaviors in hours. With a bestard the new with it a piece of plate giass may be put into a crise and filed like wood; any other out of the may is used, but where there is much giass to remove, the compare the file to bester.

For identifier small places, a brass tube of the disa-tion of the plate winded in better than a drill. The land, globally his ensists smooth jet the eith that is to come in particular to what is better, dismodel drill. The land, globally his ensists under damped with curtover-gian province or what is better, dismodel drill. The plates may help in piece of wood having a plate decided of the company of the company of the company of the plates may be in piece of wood having a plate decided of the company of the company of the company of the decided of the company of the com

made in the side of the tube by filing into it with a round file, and it may be turned either by a drill press or by one of the small, geared, hand drall-atocks used for small drills. With a small brush dipped into the solution as herein given wipe the hole so that a little of the mixture will run down inside the tube, and onto the glass where the hole is being made, and the tube will be found to enter the glass with sur-

If it is desired to have the edge of the hole sharp where the tube comes through, coment a small piece of

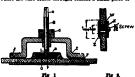


Fig 1 Fig. 1 -- APPARATUS FOR BORISO LARGE HOLES IN GLAM. Fig S -METHOD OF REPAIRING CRACKED PLATE GLAM.

giass to the under side of the plate being bored, and when the tube is through, continue the boring until it has entered the lower plate slightly Glass cut with the diamond will often break unevenly, and fail to fit a window sush, circles cut out for the disks of instru-ments of the clock class, circles for static electric ma chines, glass covers for galvanometers, ammeters, and many other instruments are often thrown away, when a touch with a file wet with this solution would save them It is especially recommended to glaziers to re move the sharp edges of the glass cut with the dia-mond, which often cut the hands. For boring large move the snarp edges of the gauss cut with mond, which often cut the hands. For hori holes in plate glass the Jig shown in the section Fig. 1, is very handy, in fact almost essential if correct re-sults are required. It can be

easily modified to hold the cutter for boring circular work, such as glass columns or con cave surfaces, where circum-stances require such variation The frame is an iron casting having feet J, and is bored out to receive a steel bushing C, which may be hardened receive the shank B of the cutreceive the shank  $\mathcal{B}$  of the utter bar The top of the cutter bar or shaft is squared at A so that a bit stock may hold it, or it may be held by the chuck of a drill press. The bottom has a flange and a pilot L, which fits in the hole of a small ry wheel G of the kind used by toolmakers on univer-sal grinding machines for lapping out small holes.

e lead bushing in the wh

The lead bushing in the wheel should be cut out on the side that is to do the boring, and the should be cut to do the boring, and the cut is the side of the wheel may now be elemented to the cutter shaft by beating it, and also the wheel sightly, so as to moil some gun abeliac, which has been sprinked on the top side of the whole. After it is cold mix up a stiff partie of liquid gits and emery of about the same grade as the side of the whole. The city is still partie of liquid gits and emery of about the same grade as the side of the whole. of In drying it will shrink slightly and the paste be applied again, and until the surface is flush wheel with the side of the wheel.

with the side of the wasel.

The feet J of the frame have thin rubber F (known in the stores as "rubber dam") comented to their under sides with bisycle time cennent, so that when placed on the giasa the jig will not slip around, but can be easily held in any desired location

The place where the hole is to be made having been

The place where the hole is to be made having been scerationed, ring of puty D B stack to the glass to form a cup, and after the wheel shaft is inserted in the bushing, the apparatus is placed with the face of the wheel over the spot to be bored, with the face of the wheel over the spot to be bored, with the face I restling on the glass. Before bourdining operations a place of double-thick window glass I'll incommend with French copil warrah to the under side of the plate to

The formula for the fluid to be applied to the tools

as follows Pulverised can

Balpharic other

Beigh all tryestins to make a strouge bottle full
Apply the let stock to the shank at or the shart, then
passe coupled for the shalt into the putty cop' to cover
the letter of the shalt into the putty cop' to cover
the letter of the shalt into the putty cop' to cover

When the wheel is turned it will immediately en the glass, boring a vory smooth and true hole if a drill press is used, the speed should be slow to avoid throwing the find out of the cup or heating the wheel, the last being especially avoided, as all of the constitu-ents of the find are very volatile, and it will evaporate quickly if much heat is present

When the hole is nearly through moderate the pres-

went too note in nearly tarough monorate the pres-sure, but keep on drilling until the wheel has entered the plate H slightly A slight tap with a hammer will now knock the window glass off, and the wheel and shaft may be removed through the hole. Do not at tempt to remove it through the top unless the hole is very clean, or you will p. Il the wheel off the arbor

Fig 2 shows how a cracked plate-glass window may be repaired. At the ends of each crack and where they intersect a hole is bored to receive a bolt. The they intersect a noie is bored to receive a noi! The mut Z of the boil is made thin, and a rubber washer, made of engine packing is held against the glass by a washer and a rew The dimensions given are thous-used some time ago in repairing a store window. The heads of the screws were located inside the store, so as to make it impossible to remove them from the out side. The window is still doing service

## A WAGON JACK.

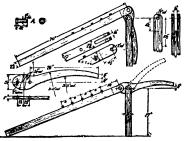
## NY L G. BATLET

For oiling wagon whoels, or taking them off, some kind of lifting arrangement is resorted to For simplicity of construction and effectiveness the jack here with described is unique. The whole, including the pegs or pins A, is made of oak, the best tough white

pegs or pins 4, is made of oak, the locat tough white oak being recommended. The beam is made from 3 by 4 inch timber, planed down to the dimensions given. An eye or slot is cut out at the wide end 1 1/10 in hes wide by 4½ inches deep This end is rounded off to a radius of 2 inches.
Five pegs, 1 inch diameter by 2 inches in longth, are
driven into the upepr side. The holes are 1 inch deep

and should allow the pegs to have a driving fit

The upright is 27 faches high to the center of the



A WARRY JACK

fuicrum, made from 3- by 1-inch stuff. The end is rounded off to a radius of  $1\frac{1}{2}$  inches, and a slotted hole is cut in, as indicated in the detail view

The lover is cut from 1 inch board, 6 inches wide by about 33 or 34 in hos in length It should be laid out accurately to the dimensions given in the larger scale accurately to the dimensions given in the larker is all view. When correctly made and the slot in the upright cut likewise the two holes for the pegs 4 will be in a vertical line, when the lever is pressed down, as shown in the upper general view. The pegs A should have a loose fit, and be furnished with small m pegs or nails, to keep them in place, w parts are assembled

parts are assembled.

To operate the jack the lever is raised as shown in dotted lines in the lower general sketch and the beam slipped in place under the sate of the wagon, which should rest between one of the small pegs in which should rest between one of the small pegs in the upper face Boaring, on the lover it is pressed down into its lowest position, as shown in the upper sketch, raising the wagon wheel from the ground and securing it in that position indefinitely, without the least chance of its slipping back

Swelling ground cannot be held by timber, means must be provided for relieving the pressure of the ground from time to time. It will cause little trouble if spaces are left between the lagging, through which pressure may be eased at intervals by removing so of the material Expedients such as packing with straw are valuable only until the swelling becomes sufficient to pack tightly the cushioning substance. When this becomes packed solidly it transmits stance. When this becomes the pressure to the timbers

#### RECENTLY PATENTED INVENTIONS.

Portaining to Apparel. 110 CLASH -- A M BARTA New York A 1 in this case the invention relates to the classys such as are attached to four in hand the to secure tion to the shirt front. The object of the improvement is to produce a the langwidth can be very aimply constructed, readily applied and effective in holding the tip in post

# Rincipleal Beviews, WHERM OF INNIATION -1 Strik BRADER AND YORK N N Mr Bit his pers invention relate to system of insulation for high potential electric conductors to its used in various raintens and for sarrious purposes such as power transactions and for gay without or table simpleyed as stays forces, or for or table simpleyed as stays forces, or for the stay of the stay of the stay of the second of the second of the loss following as still as in ordinary contraction and sorted as in ordinary con-

us risk work

(HAM MORTETINH --1 C. Teritismow it
Jaseph Mo. In the present patent the lawntion has for its sidject the provision of a dovito be used in show cases twhere the lamp
or coll used be connected with source of electric corrects which will vaporize a sofficient
quantity of water to keep the atmosphere of
the case minists as are ty prevent the drying out
of claster phenot therein.

#### Of Interest to Permana.

# Therefore to Farmers. 18 of Finder 2.6 Regions 18 in The latestime here is to provide means for litting to his pive cylinder from the ground as when the pive cylinder from the field, that we ground the ground as the ground as

grade to or drups and has in view a device of this character in which each scraper takes are: of its own dirt from the time it leaves the ditch until it is discharged at the center of the grade, thus avoiding the danger of clog ging and making the device may of operation and light of draft

In our hands of the the second control of th

servinity amounts within a put and classed to an other services at the junction or at the posi-tion ruled and tolerword in order to respect the of the black, and the high a golden to a tree or collect to the liquid. Missus provide not controlly on the crowns of the black passed belief the case in a plurality of different local-core which the black passed to the controllect of the controllect provides to the in one leatency completely setmonaged and in market completely readed out of the liquids.

gine and making the device casy of operation in the total content of the liquid and lithet of deal of the liquid and lithet of deal of the liquid and liquid and the liquid and liquid and

et the joint, and the batt is public to see controlly of the curvens of the side publics over which the holt passes.

—J P. CHORNEW MATCH RECEPTACLE.

—J P. CHORNEW ANT RESISTANCE SECURITY OF THE SECURITY O

inerty exhausted.

AUTOMATIC ERGULATING DEVICE FOR

WINER TANKS. — W L. BRURAREM. Harrisburg. Pa. The device is particularly applicable
for keying filled the tanks or troughs disposed in the contex of a railway track for the
purpose of supplying water to a passing or

gian. The device is actuated by a float in

which the vaive mension is operated directly

by the water pressure from the water sain.

# Prime Movers and Their As

Prime Hevers and Their Accessories, GOYKINNO. J P. Nucovow Franchil, Ind. Particularly stated, this huvenine relates to improving the valve mechanism forming a part of the further and also improving the form of the widths certaind by centrings force, and also improving the form of parts associated with these weights and with the valve con-trollable by the governor.

MAILWAYS AND The Accessories.

PLUE PRINT AND ITS ATTACHMENT

TO A COMMAND AND ATTACHMENT

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## TWO DESIGNATIONS.

(Continued from page 196.) to W. H. Mullins Company exhib heretofore, several of its small steel is, but the construction novelty of the ras a hull built of phosphor-brons show was a null built or phosphor-breuss plates riveted together and attached to the ribe by means of U-shaped clamps passing over the latter and riveted to the bull over the latter and riveted to the hull.

These boats were constructed by the
Davit & De Groot Company, a firm
which has had a great deal of experience
building riveted stochhull liteboats for
the United States government. The phoephor-bromes hull has a great advantage
over the steel hull on account of its nonover the seem and in addition to this the new construction does away with rivets through the ribs. In a 36-foot tivets through the ribs. In a 36-foot of sequence exhibited by the same cencera, sequence exhibited the same cencera, there was installed a new type of hydracities of the second of the with a mixture of oil and giveering, wery slight movement of the transmitting pistons at the steering wheel being sufficient to actuate the rudder positively. The mixture used is non freezing, so that cold weather does not affect it. This ring gear appears to be a decided im provement over the usual form, since it is

ioexing
Probably the most popular craft exhibited were the open speed beats, which vary in price from \$1,000 to \$3,000 or \$4,000
Twenty five miles per hour was the highest speed guaranteed by any of the makers of these boats exhibited, and the materiary of them and not make more than the property of them and the materiary of them and the material of them does not make them. the makers of these boats exhibited, and the majority of them do not make more the majority of them do not make more than 18 or 30 miles an hour For the man of small means who is content to travel slowly, there were boats (open launches) varying in price from \$104 to \$1,000 Some of these launches were fit ted with automobile tops. The cruisers were larger and more comfortably fitted out than ever before. The price of these empared with their size and usefulness. An average speed of 10 or 12 miles an hour is all that is aimed at 12 miles an hour is all that is aimed at with this type of boat. In many in-stances electric lights run from an igni-tion dynamo were fitted, while comfort-able bunks, a small galley, etc., were the

The exhibit of engines this year was a large one While many manufacturers still stick to the 2-cycle motor, this is used chiefly on low powered, slow-spe boats having one or two-cylinder motors The speed craft almost invariably are fit ted with 4 or 6-cylinder motors of the 4 cycle type A 100 horse-power Miets & Weiss reversible kerosene-oil engine was Welss reversible kerosene-oil engine was one of the striking onjines exhibited, also a 225-horse-power 8-cylinder 4-cycle motor built for a racer by the Jeneick Motor Company The Dean Manufacturing Company showed the 8-cylinder 80-horse-power 8-cycle engine with which they made their record run from financial to the strike the s which they made their record run from Bi, Louis to New Orleans sat year in the "Brer Yox II" The Standard Motor Con-struction Company exhibited a complete line of motors, including the 18-horse-power double-acting 8-cylinder engine power double-acting experiment on its submarine. The smallest and light-est marine motor exhibited was the Wa-terman 12-horse-power 4-cylinder motor-shown in a small 14-fost boat intended for a young lady This motor weighed about 100 pounds complete. One of the shoet 100 pounds complete. One or the novelties of the show was an inclosed fly wheel having pockets around its peri-phery. The discharge of the exhaust into these pockets helped to turn the motor, these pockets halped to turn the motor, the flywheat lites acting an amufler. A new form of times, constituing of a simul legislate was established. A specialty built implication that the state of the simulation of the simulatio



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A SHEPLE CAMERA-SHUTTER MADE OUT OF A PARTEROARD BOX, PINS AND A PARTEROARD IS the subject of an article in Selectific American Supplement 1978. HOW TO MAKE AN AKROFLAND OR GLID ING MAURINE is explained in Scientific American Supplement 1888, with working drawings.

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EXPERIENTS WIFF A LAMP ORTHERY
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THE COMPTRUCTION OF AN INDEPENDENT INTERRUPTER. Clear diagrams giving actual dipensions are possibled Scientific American Explanate Int. American Proposed at a poblished Scientific American Proposed 1828

AN EXACTLY MADE RICH PREQUESTRY APPRATURE YEARTH OLD THE TREATMENT APPRATURE TO AMERICAN COUNTY APPRATURE TO AMERICAN APPROPRIATE APPROPRIATE

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THE MARING AND THE UNING OF A WIRKLESS TRINGSAPE TURING DEVICE. Hostrated with diagrams, Belevitie American Repplement 1894. HOW TO HAKE A MAGIO LAWTERS, Sales THE CONSTRUCTION OF AN EDGY HITE. THE DEMAGNETICATION OF A WATCH is thoroughly described in Scientific American Sup-plement 1981

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HOW A CALORIO OR NOT AIR EMPLOYER
CAN HE MADE AT HOME is well explained,
will be held of libertuiene, in Securitie
American Supplement 1874.

THE MARKING OF A REMOSTAT to cuttised
in Scientist American Supplement 1894. Seed articles on SHALL WATER MOTORS are contained in Scientific American Supplement HOW AN ELECTRIC OVER CAN ME MADE is explained in Scientific American Supplement

THE BUILDING OF A STORAGE RATTERY to described in Scientific American Supplement 1688. A SEWING-MACRIFE MOTOR OF SIMPLE DESIGN is described in Scientific American Sup-plement 1216 A WELATSTONE BRIDGE, Sale

Good articles on ESPUCYION COILS are contained in Scientific American Supplements 1838, and 1867. Full details are given so that the coils can result by manch by anyone. NOW TO HARR A TRLEPRONE IS A MODEL STRAM ENGINE is thoroughly described in Scientific American Supplement, 1867. HOW TO MAKE A THREMOSTAT is explained in Scientific American Supplements 1961, ANDROID BARDESTERS, Se

3 WATER BATE, Scientific Asserted Order from your newsdouler or from MERCH & CO., but., del Spreadoup, New York

(Chooledes from sage 202) bont, two men expect to make the has arious 7-mile trip through the rapids and the whiripool next summer to Lewiston.

Canada
The motor beat industry, as mirrored by the 1910 show, is increasing by leaps and bounds. Already there are 80,000 motor boats in use in this country, and it is safe to say that by the end of another year this figure will be materially Incres

The two general views of the Boston aeronautic show reproduced herewith will give our readers a good idea of how well-filled was the large hall at Mechanics Building with the machines of Americas inventors at the recent show While a the lines of some of the successful European models, most of them were pattern after American models, such as the Cur-tiss and Wright biplanes and the Pfitmer monoplane In one of our illustrations a monoplane on the general lines of the Bieriot (the "Morok") with the sliding wing tips invented by Pfitsner instead of wing warping, appears, in the foreground, while the large Antoinette type with triangular body and the smaller Ble angular body and the smaller Bierrot type monoplane were both exhibited by the Scientific Aeroplane and Airship Com-pany of New York Both of these ma-chines were constructed by Stanley Y. Beach

Another general view of the hall shows the former of these two monoplanes in the foreground Another monoplane of original construction (the "Burlingame") appears in the distance, while hanging from the ceiling is a biplane glider constructed and used by the students at Bos "Tech," and just below this another tion "ree", and just below this another glider built by two boys after a description published in the Scientific Assentant The balloon "Boston" the club balloon of the Aero Club of N S. is seen partially inflated in the center of the hall, while on the right-hand side are seen several balloon baskets, among them be-ing that of Leo Sievens's small one-man balloon "Mercury" and the banket of a 160 000-cubic foot balloon capable of

carrying 20 passengers.

The l. A W biplane and revolving cylinder 2-cycle motor was one of the novelties of the show This biplane was constructed somewhat on monoplane lines there being a rectangular body extending out behind and carrying the biplane hort sontal rudder for steering up and down The motor was mounted on trunnions The motor was mounted on Irunnions close in front of the main planes, which mounting makes it possible to direct the mounting makes it possible to direct the propoller upward slightly when the machine is running along the ground in order to rise. The new revolving-rylinder motor used on this machine is said to one of the lightest motors of this type yet one of the lightest motors of this type yet produced. It is soon to be put on the market in two closes of 60 and 100 horse-market in nower

photographs, there were numerous other full-size machines. Most of these were described in our last issue. A Farman described in our last issue. A Farman machine like that used by Farman at Brighton Beach in 1908 was put on exhibition when the show was half over machine was the only aeroplane said to have made a short flight previous to the opening of the show

## THE VERALANCED BULLET.

(Continued from page 205) based, indicated plainly that the ca so simple after discovery, was not sween surmised. Their attempts to reduce it were based upon the theory that the blast of powder gases at the musics, or some condition of the rifes here at the numeric, was responsible for this apparant sudden change in direction of the builders light at this place. Pervisitent screen sheeting and comission of comparison of compa so simple after discovery, was not ever

(Concluded from page 210) arly that this X wn, indicated cles egyor was not the only error Another chase was at work which added to or subtracted from the X error, and while experimenting for this the author desig

mated it the "Y error."

He had known for years that tipping builets make a spiral flight as they pass rough the air E A. Leopold deter-ned the diameter of some of these spi rais several years ago it was generally believed that a builet often makes a spi-ral flight over the range, and the cause of this Y error at the target seemed to ante some connection with this spiral in the air, which nearly all unbalanced bullets describe. The author's own screen abouting exhibited clearly the diameter of many of these spirals and the distance from the mussle at which the spirals commenced He found the cause of the Y error to be as simple as the cause of the X error

The X error spiral ends at the musale, while the Y error, in the air, commences about 12 feet from the musale. The bulabout 12 feet from the muzzle The bul-let makes an apparent change in its direction when it lear es its X spiral at the azzle, and it makes another change in its direction when it goes into its Y spireal The resistance of the air upon a tipping bullet produces its air spiral, and the rigid walls of the rific barrel pro-duce the X spiral described by an un-balanced bullet in the bors. The pitch of the X spiral, or the distance of one turn of the spiral to the next, is the me as the rifle twist which for a 032 caliber is about 12 inches The pitch of the Y or air spiral is about 46 feet

the f or air apiral is about 45 feet.

The diameter of the bore spiral varies from a fraction of a thousandth of an inch to several thousandths of an inch.

The diameter of the air spiral varies from a few thousandths of an inch to 7/16 of an inch, depending upon the amount the bullet tips in its flight. The amount the bullet tips in its night. The air spiral, of course, results from the fact that the tipping bullet does not point in the direction of its flight.

The causes of these two errors, X and

F, are the same in principle, but their positions are reversed. The workings and explanations by actual experiments, well illustrated, are set forth very elaborately by the author

racety by the author. The following vonclusions may be drawn from the book in careful rest target work, under favorable shooting conditions, the X + Y error at the 100 or 200-yard target is about 80 per cent of all errors. The X and Y results from the fact that the following the form the fact that the about 80 per cent of all errors. The X and Y results from the fact that the tangent of a spiral  $(c \cdot t)$  forms an angle with the axis of its spiral  $(d \cdot d)$ , as may be seen in Fig. 3. The bullet as a whole makes a suiral flight while in the rifle. because it is unbalanced or because does not lie central and straight with the does not lie central and straight with the bore it makes a spiral in the air be-cause it is a tipping bulle! It is a tip-ping bullet because it was unbalanced when it left the muss! The unbalanced bullet, with respect to the center of the -fife bore, is therefore the prime cause of its X and Y errors

To overcome the error which is inhe-rent in the rifle and its ammunition, the rent in the rife and its ammonition, the bullet, before being shot, must be a bal-anced one, that is, its center of gravity must coincide with its center of form The powder charge must produce uniform pressure from shot to shot. The rifac-barrel and ammunition must be so con-structed that the projectile remains bal-snowd throughout the entire bere

have a projectile start from the sie in the right direction, that is, in the line which forms the center of the bore, the entire bullet just as it leaves ours, the entire united part as it serves the mustle must be symmetrically bal-anced around the line of fire. Any rea-sonable rifleman would admit this last statement. What the author's work has disclossed, however, is to point out clearly the fact and its importance, and to show mathematically that practically the whole error at target attributable to the mod-win rife and its ammunition originates in the unbeisneed projectile.



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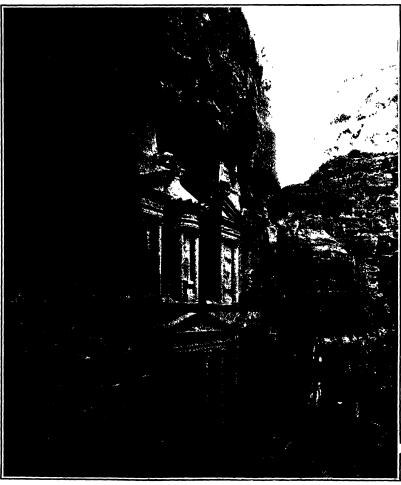


### A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. (11 -No. 11. )

NEW YORK, MARCH 12, 1910

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El Kharneh el Farioun (the treasury of Pharaoh) Petra-

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#### SCIENTIFIC AMERICAN

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NIW YORK SATURDAY WARCH 12th 1910

The folion is always had to receive for examination directated at on stoperts of time by interest. If the photographs are sharp, the ar-short and the facts authority the contributions will receive spiral attention. Acquest after with te post for a regimer space, there

#### THE "WHIP-CREATION' BATTLESHIE

Ilk Washington correspondent who is re-sponsible for the distribution of payal and military news to the daily press of the country has been writing some extremely silly nonsense about the two battleships which the silly nonsense about the two battleships which the House Naval Committee has recommended for this years programme, and he has put into the mouth of Secretary Meyer statements as to the objects which have impired the request for these two powerful was have inspired the required for these two powerful wa-scle which we are privedly antified the Servery could never have uttered. According to the dispatches the motive responsible for their unspre-electrical size, reserved to be from \$80,000 to \$3,5000 toms, is the desire to balled a couple of ships which shall be blacer than anvihing class affect and give to this matter the present of size affect and give to the latter than anvihing class affect and give to the increase of the size of powership kattleships which in respect of size and term producing qualities shall be supermeds of the ship creation of our

be superned of the with contino oder.
It is sufficient to say one and for all that the day
of white cention southment has long ago passed if indeed it seer existed except on the street or in the
music half ballad. Certainly it was never a motive in If indeed it exist existence except on the street of it the music half balled. Certainly it was never a motify in the uphatiding of the United States may. Our frig. ates of the sailing days were built swifter and armed stronger than the ships then affort in other navies not for the valuations of being able to say that they were swifter and more heavily armed but for the ters practical purpose of overtaking the enemy bring ing him to action and crossing him by superior gan The policy of that early time has been the policy f our navy in the intervening one hundred years at it is its policy to-dry. If Secretary Meyer believes it to be expedient to build a ship many thousand tons larger than anything contemplated abroad we may rest assured that it is because he and his mival ad viscis believe that to maintain our traditional su performs in gun fire we must most up from the 12-inch to the II inch gun and increase our displacements in proportion

most efficient bartleship is the one which et bodies the maximum amount of all round military of ficiency on the minimum amount of displacen Unless the present theories of naval designers very much at fault, a ton of displacement in a big battleship gives more military value than it does in battleship gives more millitary value than it does in a abip of smaller size. Thus 2000 tons in a Deliavarr is a more valuable asset than the same displacement in two "Gresons". Here then is another cause of Bell-Yamid growth in recent vases in the tonnage of the first-lines fighting sith j. From the 12 500-ton 'Maline' our ships of the first-line line recent value to the 16,000 tons of the the 16,000 tons of the "Commercial value" in the 200 decision of the tempercial value of the 200 decision of the 150 decision of the 150 decision of the 150 decision of the 200 decision of the 150 decision of the 1 Arkansos and Wyoming' which are now upon

the stocks

The big jump of 25 per cent in displacement between the "Connecticut and 'North Dakota" was due
to the coming of the dreadnought type and the adoption of an exclusive main armament of 12 inch guns day we are on the eve of another great advance, rouny we are on the eve or another great savance, and again it is due to a great increase in the weight and power of the battery this time by the substitution of the 14 inth for the 12 inth sun. The House Committee on Naval Affairs has accepted we are glad to see the Secretary's programme for increasing the force of the navy by two battleships two fleet colliers one renair ship and four submarines of a new type ual speed and steaming radius. According to risions, the battleships are to be of at least 28. the provisions, the battleships are to be of at least 25-000 tons and each ship is to carry ten 14 inch guns, the

thips being made of sufficient displacement to carry this battery. The 14 inch gun, however, with its mount ammunition, etc., is so much heavier than the 12 inch that the new vessels even though two less guns, will have to be of at least 28 000 tons displacement, and if it should be decided to mount twelve such guns, the displacement may run up to 30 000 tons and over Because of the greater punish ing power of the 14 inch gun at long ranges, a bat tery of ten 14 inch would greatly outmatch one of twelve 12 inch. There is no ship affoat or contemplated so far as we know, among the nav among the navies of the

OME very remarkable (estimony has been elicited by the Joint Committee of the Legislature which is investigating the extending the jurisdiction of the Public Service Commission to and over telephone and telegraph companies it is remarkable as seeming to indicate that in spite of the large amount of thought, in-genuity, and mechanical skill which have been dirested with marked success during the past few decades to the improvement of the speed and lowering of the cost of telegraphy practically the whole of the business of the big telegraph companies is to-day sent business of the big (elegraph companies is to-day sent lo the hand-operated Morse key, in much the same way and at no greater speed, than when Morse first under telegraphy a practical commercial art. Thus, according to the testimony of Col Clowry, president of the Western Union, the maximum speed of transm is obtained in their service by two systems the Wheatstone and the Barclay the former having a capacity of 125 words per minute, and the latter of 40, with an average of about 50 in practical use. and these two forms of apparatus, it would seem, represent the only departure made by the Western Union Company from their almost universal practi of operating by hand by the Morse key

Side by side with this evidence testimony was lyen that rapid telegraphy systems have been given that rapid telegraphy systems have been developed here and in Europe with cause ities of from 500 to 1000 words a minute and over one system.

(stablished in several centers in the United States
being now in dully use which is sending message. leting now in dulity was which to some an account at a rate of 1000 words per minute. The public will unturally nak if such high speed he possible why do not the tote graph companies make use of the system and so turn us their capacity and make the conand so liter by 1967 spiritry and unite the cer-responding derroas in rates. In his testimony (of Coxyy explained that the Western Informatia and unexage business and that the company cannot hold messages until they sed a sufficient number to send in 1000 and uniture rule this is true as re-gards the single short message. But in the case of the longer massages approaching the manuscript letter length the type of business which would be certain of enormous development if it were offered to the public throughout the whole twents four hours of the day at the low rates which would then be possible -it would be proclicable to set half a dozen operators at work simultaneously in punching the sending tapes and the message could be sent through in less than one cent the time that it would take by the present methods The transmission of Peary's 8000-word sage from Indian Harbor to the New York Times was quoted as a great feat in telegraphy. It took a of twenty operators three days to get the mema By the rapid telegraphy system the same through message after being prepared on the tape could have been sent over a single line in about ten minutes Ilma

The high speed methods as worked out b The high speed methods as worked out by Hughas, warray, Polisk Virsa, and Delang chaim to send at the rates respectively of 4.500, 15,000 \$15.000 \$15.000 and \$6.000 area per hour. The significance of these methods to the public is that by their use the telegraph could be extended cheapened and popularised until it was as available to the ordinary vittem as the armore highly developed telephone of the present

NEW YORK AND PARIS SURWAY STRUMS COMPARED. YEW YORK CITY is justly proud of its subway system, but it will be a surprise to some of us to learn that the subway system of Paris us to learn that the subway system of Paris actually carries a larger number of phasengers during the year, the total being 333,000,000 as against 200,000,000 errirds on the New York system. Outside of the mere fact that more people were carried the compactions is entirely favorable to the New York subway. The details of the following comparison have been worked out by R II withing, the faulthicken of the New York Public Service Onomission, and they afford upon a most timely subset a basis of valuable information, which are subset of great services to the Commission in the Important were of great services to the frier and cannot rail to or great system to the Commission in its important work of regulating transportation mattern in this city. There are certain points of similarity between the two subways. Both have been built and are owned

by the city, and both are leased for a term of years to an operating company. The longth of the two systems in miles of single track operated was in 1869; the year for which the latest figures are savallable, very nearly equal. But the Paris system, which is entirely two-track, forms a network of lines covering a district having a radius of three or four miles from the business or traffic content, whereas the New York system has a single seen terminating in two long forts tem has a single stem terminating in two long fortex at the upper end, and extending 14 miles to its most distant point from the Brooklyn Bridge, which may be called the chief traffic center. The Paris subway has no express service, whereas the New York subway has four tracks (arrying express and local service for six and a half miles through the most congested trici

The population of the district served by the subway system was 2,750,000 in New York and 2,790,000 in Paris The area of the city proper of Paris immedi ately tributary to the subway is 31 square miles, the area of Manhattan and the Bronx served by th way is 62 square miles Hence the population of the district served by the Paris subway is more than twice as dense as that served by the New York system. There is a total of 646 miles of single track in the New York and of 622 miles in the Paris subway

yew ork and or \$2 2 miles in the Paris subway. The great superiority of the New York system is due to the frequency of the trains and the higher speed of travel in Paris during 1908 the least headway during rush hours was 2 minutes and 33 seconds of the paris of th way during russ yours was a minutes and on sevene and the greatest 1% minutes. The least headway in the rush hours of the express trains in New York was 2 minutes and the greatest 4 minutes. The max mum length of the Paris train was 236 feet, of the New York train, 411 feet. The average speed in the Paris subway is 12 miles per hour, and in the New York subway, 18 miles per hour, the average speed of York subway, 18 miss per hour, the average speed or express trains between Brooklyn Bridge and 88th Street being about 24 miles per hour and the average speed of the local trains about 15 miles per hour. The maximum speed in the New York subway is 40 miles per hour, as against 217 miles per h

The rates of fare in Paris are first class 48 cents. d class 29 cents and second class round trip tickets 3.8 cents equivalent to 19 cents per trip York there is a uniform fare of 5 cents, but while the fare in New York is 5 cents, the average length of ride per passenger is from two to two and a half tir

In Paris the capacity of each car is determined by the government, and in 1908 the average number of passengers per car was 64. The capacity of the New York cars both scated and standing estimated on the Paris basis was 103 but this frequently rives to 150, and even 170 passengers per car. In Paris the num-Pails basis was 101 but this frequently riess to 100, and cven 170 passengers per car. In Paris the number of standing places is fixed by the government, in New York the limit is apparently fixed by the ability of a burty platform guard to boost the passengers in of a burty platform guard to boost the massengers in by a well-directed football rush. But wore the gov-rrament allotment of floor space, as obtaining in Paris applied in New York, the maximum capacity of a New York sulway car would be cut down from 170 to 103 The number of passenger place-miles per mile of track was 73,000,000 for New York and 38,000 000 for the Paris system, and yet as we have seen above the Paris subway, because of the shorter length of the trips carried a greater number of passengers in the

Year Congestion in Paris is not nearly so great as in New York, first, because traffic is more eventy distributed throughout the day, secondly, because the currents of traffic in Paris move in both directions during rents of trame in Paris move in both directions during the rush hours, and thirdly, because the passenger in Paris takes a shorter average ride, and vacates his place for others. The longest possible ride on the New York subway is 17½ miles, though it is not proble that many people take the trip from Atlantic Avenue, Brooklyn, to 222nd Street, New York, for the Avenue, Brooklyn, to 222nd Street, New York, Nor the pleasure of the trip, and certainly not many for busi-ness purposes. The total cost of the New York sub-way and its equipment was \$87,928,000, consisting of \$61,280.00 actually paid by the city for the construction of the subway and \$58,648.000 that the company claims to have expended for both equipment and construction, including \$10,048,000 which it claims to have spent in the construction of the andway from Brooklyn Indian half. to have spent in the construction of the subway from Brooklyn Bridge below Broadway and the East River to Brooklyn The total cost of the construction and equipment of the Paris subway is estimated at \$62,353.

The New York subway fared much better this Paris subway in the master of taxes, the former paying but \$900 per mile of single track as against \$4,300 per mile paid by the Paris subway The New York per mile patid by the Paris subway The New Years, mbway considered as an economic undertaking earned about 7 per cent on the capital javested, while the operating company carread about 7 were cet on its reported intestment. The Patit subway caused 7% per cent on the total estimated coet of conputries and equipment, and the operating company carreed 5 per cent on its reported javestures.

### ENGINEERING.

A recent wreck in the London & Brighton Rallway, Ragizand, when an express left the rails and crashed hato the relitway station, has again illustrated the light construction of English cars A Pullman car was comparatively little damaged, whereas the ordinary day coaches were completely wrecked.

The new single-phase electric freight locomotive which has been built for the New Haven Railroad was recently given a test between New Rochelle and Stam ford, a distance of 17 miles. The load consisted of thirty loaded freight cars, and the distance of 18 miles overed in 27 minutes without pushing th to its full capacity

In a paper before the Engineers' Society of West ern Pennsylvania, E. F Bulmahn described a new type of bituminous gas producer which embodies the good features both of the speriart and the down-draft type corrossing the production of tar and comploidly con-cernousing the production of tar and comploidly con-cernousing the production of tar and comploidly con-cernous the production of the product of the pro-ton operated as a down-draft producer to break up the westlett matter, the other as an underst morderer to one operated as a construct producer to consume the fixed carbon, the resultant gas being taken off at the center of the producer

Takes out at the conter of the producer

These was when it took nearly six years to build
a battleship in private yards in the United State,
but the construction, of the "Connecticut" as the
government yard at Brooklyn set a pace which has a steadily accelerated. The "Mississipuji," whose trials took place as recently and Cotober, 1907, took 44 months took place as recently and Cotober, 1907, took 44 months of the Construct. The "New Hampshire" December, 1907,
was built in 58 months, the "North Carolina",
was built in 58 months, the "North Carolina",
cattleship, 1909, in \$44,0 months, Michigan'
(battleship), October, 1909, in 27 months

West improvements are being made in the Trans-Biberian Rallway which, in addition to being double-tracked, is being largely relocated with a view to the elimination of grades and the shortening of dis When the work has be tance from Paris to Peking will be 6,300 miles instead of 7,500 miles over the present line via Harbin and Mukden, and the fourteen days now consumed on the trip will be reduced to nine and a half days. The value of these improvements will be as great from the military point of view as they will from that of passenger and freight traffic

Speaking on the relative economy of the single Mr. George Gibbs is of the opinion that maintenance costs of the single-phase system as at present developed will be somewhat higher than for the direct current though eventually they should be about the san the other hand, he estimates that about 13 per cent less energy would be required at the power house for the single-phase than for the direct-current system Adding the saving in sub-station operation, he for a saving of from 4 to 5 per cent in the total oper ating cost in favor of the single-phase system

The tremendous floods of the past season on the lathus of Panama have helped to demonstrate, even be-re completion, the wisdom of building a high level rather than a sea-level canal Through the swamp near Gatun the bottom of a sea-level canal would be ome 50 feet below the general ground level, and at some so reet below the general ground level, and at Gamboa, where the Chagres River pours its enormous and sudden floods sorose the canal cut, the river bed would be 90 feet above the canal bottom. Under the torrential downpour, the discharge of alluvial sitt into the canal would make necessary constant drediting the canal would make necessary command and might result in the temporary obstruction of the

and might result in the temporary obstruction of the channel.

There is great activity just now in experimental work in the direction of speci-dealeng gaze for marine turbines. We noted in our fluids gaze from 12th that the siderline-incolping mechanical gaze in 12th that the siderline includes a helical reduction gaze in the following teaching have been supported by the siderline production gaze in the following including production of the following have been supported by the siderline of the siderline production gaze in the following in the siderline production gaze in the siderline production gaze in the siderline production of the siderline siderline in the siderline production of the siderline siderline in the siderline of the siderline siderline in the siderline siderli

### Scientific American

#### AERONAUTICS.

The latest German airship— "Paraeval V "—left Bit-terfold at 10 15 A. M March 1st on a voyage to Berlin The capital city was reached actoly the 50 miles being covered in 4 hours. This airship is the smallest non rigid passenger-carrying dirigible yet constructed its length is but 50 meters (50 feet)

With the same make of 50 horse-power revolvingcylinder motor used by the ill fated Delagrange, and which drove his machine at the rate of 50 miles an which drows his machine at the rate of 50 miles and hour, Le Bion few 10 kilometers (521 miles) in 8.74/5 (45.82 miles per hour) and Ralsan 5 kilometers (31 miles) in 4 1 (46.33 miles per hour) at the first foreign aviation meet of the year at Heliopolis, near set of the year at Heliopolis, near Cairo, Egypt Both were awarded prizes.

The 1910 model Bleriot monoplane has a body only 66 meters (2164 feet) in length The body is com-pletely covered There are wide housenist fine on each side at the rear, forming a tail, and the horizontal rudder is in two parts, one of which is hinged to the rear edge of each fin The tail resembles that of the Antoinette monoplane, but Bleriot still uses a rectangu lar-section body instead of the V-shaped form which imparts to the Antoinette machine its excellent trans verse stability

The recent decision of Judge Hand against Paulhan in the Wright brothers' suit, the granting of a pre-liminary injunction, and the requirement of a 225,600 bond for one month in case Paulhan wished to con-tinue his flights, has put a sudden and to the making time mis nignus, has put a sudden ond to the making of exhibition flights in America by this daring record breaking Frenchman The bond was reduced to \$12,000, but Paulina's manager although under contract to pay him \$5,000 per week has brought the aviator to New York to await the result of an appeal The car will be reopened on the 12th instant

Gen. Brun, the French Minister of War a month ago inspected at Villacoublay the four Wright biplanes which have been built for the French army Count ort explained the mechanism but mad cause of an extremely high wind. At the same time the army Antoinette and Farman machines were inspected at Mourmelon by an artillery officer, Com-mandant Estienne On the 3rd ultime Van den Born niandant Estienne On the 3rd uillimo van den Born made a Sieminute flight in one of the Parman biplanes, carrying a useful load of 201 kilugrammes (444 pounds) On Mark 1st Lieut Cammaran of the Engl Boer Corps flow 38 milles in a similar machine Bleich also has been instructing Liout. Aquaviva with success

A man who has made a thorough investigation of se accident to the Bieriot monoplane which cost the life of Leon Delagrange, has concluded that the acci-dent was the result of the aviator getting "rattled for an instant when he was flying low and was about to turn. It is this man's belief that Delagrange threw his control lever too far to one side—thus warping the na control lever too far to one sides thus warping the wings too much and tipping the machine severely— and then too far to the other the result being that the machine swayed so violently that it turned over it struk the around upside down, and all the guys elements of the strukent of seen left out) was found in place and unbroken. As order and the accident was not due to the failure or

Now that Germany has produced neveral "men birds many new scroplane investors are rapidly appearing.
The majority of these favor the monoplane, with which
type the first \$10,000 cash price (the Lans price) was
won by Herr Grade lagh fail. Dorner and Hilman are won by Herr Grade laght fall. Dorner and Hilmana new from of the lating successful experimenters with this Upe of ascensé—fo whom should be adeed Major non Parseral, who has a huge 1-meter (46 foot) span successful and the same and the same and the machine is undergoing its prediminary tests on the shore of the latin at McKinebury On March 1st Herr Paul Lauga attempted the first acropiane flight to be made at Drusdon. He rose to a height of fest, when a violent wind gent capatised the ma-chine, which fell and we have the contract of a successful the same and the same and the chine, which fell and the brilines

for escaped with had bruines

The making and frings of model acroplants in a notentified diversion from which much may be issued
entified diversion from which much may be issued
deversed interesting new forms of scoreplanes have been
developed from models, and many numbers have
deversed tile behavior in flights of the various types of
machines. Hebos the first national contest of the
Accountatio Society by the Channate oup and other
prime, which was hald in the 6th Regiment Armory,
New York of the visit of March 1rd, was
happy hypersed. A content that the models having
hypersed. A content that the models we have
happy hypersed. Dailyanian had a Langley-type machine with 4 iary propellers, one at either corner All the models wer latended from a table. The longest flight—148 feet-yets made by the monoplane of Frederick Watkin, 18-year-old boy. Other contents will be held weak chine with 4 large rick Watkin, a

#### SCIENCE.

SCIENCE.

Prof. Resoched O Parker of Columbia University announces his intention of attompting to second the Alaskan peak, Mount McKinley He states that either he will reach the summit or prove that it can be reached only by an aeroplane

The alcohol produced from sawdust ar not be confused with wood alcohol, for, although standard alcohol is primarily made from wood, it is reassests section is primarily made from wood, it is produced directly by the formentation of a pure sugar solution, into which the wood is first converted, and it is the same, both chemically and physically, as the alcohol made from grain

Enud Rassausson, the explorer, will sail in June for Greenland on an expedition which will consume four years. The ethnographic study of the Enkinos is the purpose of this expedition. One year will be spent at Cape York and a year each at Hudsons and the Crown Bays After the navigation of Baffin s Bay Ras-mussen expects to circumnavigate Alaska and to sail to the Aloutian Islands and return via San Francisco

to the Aboutan blands and runn vie San Francisco.

Sift Brass E Bhackslean, the Antarctic explorer,
who is to lecture in this country, will arrive on the
Lustitania on March 25th Befrow the explorer savres
Washington, where he will be the guest of Ambassofter
Bryce he will reveive from President Tart the gold
modal of the National Geographics Boolesty While
in New York he will be presented with the gold modal
of the American Geographical Boolesty of New
York

Prof. E. B Barnard of Yorkes Observatory informs us that on February 27th last he obtained with a one-hour exposure a photograph of Halley's comet, showing a faint tail of two degrees, equivalent to a of about fourteen million miles. This is important in relation to the question as to for the tail will reach the earth on May 18th From these photographs taken so far from perihelion, it seems that the tall will be amply long enough to reach the earth

The Royal Geographical Society of Italy, at a largely attended meeting ratified the recommendations of the committee relatively to the bestown of medals and other committee relatively to the bestonal of medials and other distinctions for the year 1000 Three Include Agold medial to Robert & Pears; for the discovery of the North Poles, differ medial to Cajulan Robert A Barri-lett, who commanded the steambilty "Roosevelt" on the Pears; superfittion gold medial to Lieuteann filtr Ernest II Shackiton, for his "nearest South Poles." after tablet to the Data of the Abruzzi for his expedition to the Himalayan where he made a re

The moving picture is now applied to educational purposes Chemical tests are now tablished on the acreen There are films illustrating the electrolysis of water, setion of nitric acid on silver and action of aqua regis on metallic gold etc. The test tube is thrown on the screen man; times enlarged, and the chemical action is clearly illustrated. Most unsavory but educational is a film illustrating the peril of the out countributes as a first trigger eggs in unawory places and before the yes of the speciators the eggs develop in heaps of weighting maggots. In the final stage the winged fly is shown in all its unsanitary glory Still another film exhibits the arrobatic fly lying on its back turning various articles with its insect tirelf

In the possession of Knor Hall of Natural History with its Invaluable specimen I maintion College is selectedly fortunate. By the kindness of the Hon James Rose, Li.D. '19, the original building was reconstructed into a hall suited to the display of all sort of astural history specimens. The most important collection are against history specimens. The most important collection are against its last of the New York State minerals, deglisher with related minerals from Constant, and and the specimens are found many rare once the best of their Kind in satisface in addition to describe minerals are 2,400 specimens of fossils and rocks to display the college of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York, 1,746 specimens to illustrate the geology of New York 1,746 specimens to illustrate the geology of New York 1,746 specimens to illustrate the geology of New York 1,746 specimens to illustrate the geology of New York 1,746 specimens to minerals and the property of the 1 specimens to the property of the 1 specimens to the 1 specimens to the 1 specimens to 1 specimens session of Knox Hall of Natural History mainly from the Silurian formation of Europe main's from the filturian formation of Europe never and thousand valuable specimens in pair-ontology 10-000 specimens of orest and minerals 2000 specimens of land, from water, and marine shells 300 specimens in ornithology from China, 13 000 specimens in entomoogy, supplemented by a fine group of specimens in ornithology and comparative anatomy A TREE collec oralthology and comparative anatomy A rare collec-tion of Japanese shells and insects A large and useful arbibition of the North American form, the result of Sity years of botanical study, search, and correspond eace A large and valuable collection of butterflies, appropriately mounted The Hall of Natural History is under the charge of Prof William John Miller, Ph D. an eminont authority on geology and mineralogy Dr Miller recently wrote a treatise on "The Gool ogy of the Remsen Quadrangio" including Trenton Palls and the vicinity in Oncida and Herkimer coun ties. This book was published by the University of the State of New York as Bulletin No. 126 of the Edu-

## Marcin ta 1948

## DRIVING PILES WITHOUT A PILE DRIVER

BY GEORGE H. LODGE

It may be of interest to many of the readers of the Benerive American to learn of an easy method of driving piles through the ice without the use of

Those who have tried to drive even by hand while working in water or from a small boat have found it much more difficult than one would at first suppose. I was myself confronted with the problem of building a dock landing for a lake steam boatt- a steamboat built to carry 300 passengers, be-ing 70 feet long. The problem was to build a dock or landing safe and large enough to handle the people

First we thought that it would be necessary to hire a pile-driving outfit, but my father, R II Lodge, devised a plan that works to perfection

We select straight white oak piles not over one foot

We asket straight white oak pites not over one root in diameter at the butt which are cut to the length required usually from 20 to 36 feet. These are sharpened at the butt ends to a point and with an ax a thread is cut from the point of the attek back from three to four and one-half feet, according to the size of the pile

It is important that the threads be cut as nearly the same distance apart as possible A good man with an ax can soon cut threads that are mechanical. tonishing how many, with a little practice, can it is assumenting now many, which a fitted practice, on the cut in a day. It pays to use special care in the cutting, as it helps wonderfully in the driving. Piles that are from ten to twelve inches in diameter should have threads from three to three and one-half inches apart and two to two and one-half inches deep

apart and two to two and one-nair increa ones After the threads are cut the pole is ready to drive, which is done by chopping a bole through the ice at the desired apai, being careful not to make the hole over two inches iarger in diameter than the pole, and have the ice act as a guide to keep the pole upright

this screwing it down

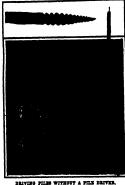
If the pole is long and heavy, it is not fasten three guy ropes to the top of it before raising After the pole is raised, it is an easy matter to keep

it plumb by pulling the ropes

The pile is raised like a comm The pile is raised like a common telephone pole in other words, a little at a time with pike poles, follow ing up under with two planks spiked together in the form of an X.

form of an X.

It is a good plan to stand a plank in the hole and to let the point of the pile rest against it, as it assists in placing the pile in the desired spot



It is also a great help to spike a short plant the pile, temporarily, just above the threads, to keep the pile from shooting under the ice before it is vertical whereupon it may be knocked off. The pile

will then drop into the proper place Now you are ready to bind a pole (or sweep lever)

to the pile. This is done with a common log chain, care being taken to bind it so that it can be screwed in the right direction. Hitch a sharp-shod horse to the outer end and tead him around the pile (capatan

It is an easy matter now to serew a large pile from four to eight feet into solid clay or gravel or to unscrew it and remove it

serve it and remove it.
The accompanying photographs illustrate the wooden threade ready for use, and the plan of servering in a left hand threaded pile by the all of a borne. We often put in smaller poles by hand, using two of them man instead of a borne.
We have recently taken out two steamer its posts that have been in use for eight years, having begun to decay. These unserved point we found had been in the contract of the

To the Cairo Scientific Journal for January last To the Cairo Scientific Journal for January hast IF B F E. Keeling communicates an interesting paper on climate changes in Rgypt. There is a strong builed among residents that changes have occurred within the last ten or twenty years (possibly due to increased irrigation) which are distinctly "sensible" without the aid of instruments. Mr Keeling quotes the man temperature at Abbasis for each pertade from 1870 to 1994, and for the four years 1995-8, which the results show that the differences are hardly greater than might be caused by difference of expo-sure of the thermometers. As regards humidity, also, sure of the thermometers. As regards number, used, there is very little evidence of any decided change during the last forty years. It is confidently asserted by many persons that the rainfall has increased during quite recent years, but the author shows that there ing quite recent years, but the author shows that there illtile, if any, evidence of ruch being the case. The total rainfall of any year is often influenced by the form one year to another. Due of the form one year to another, the offent year on record at Abbassia is 1889, with little more than a quarter of an inch or fain, and the wetter, 1904, with less than 3 inches, the mean for 1887-1808 being approximately 1.4 inch.

### AN ARTISTIC REINFORCED CONCRETE BRIDGE

#### A COMING TYPE FOR COUNTY HIGHWAY BRIDGES

In country districts where the materials are r this the reinforced concrete bridge should prove to be an ideal system for the construction of concre bridges of moderate span. We say of moderate span, for the reason that the art of trussed bridge construction in reinforced concrete is as yet in too early a stage of its development to warrant its indiscriminate use in bridges of considerable span in structures of moderate length, say up to about eighty or a hundred feet, if care is taken in proportioning the parts, espcially at the joints, and very particular care is take

in securing a thorough bond between concrete and steel, the county com missioners or other au thorities should find the concrete steel bridge a reliable and economical type. It is easy to erect, it requires no painting and practically no mainten ance whatever, it is in destructible by fire or the action of the weather, and its subsequent cost for maintenance should be maintenance practically nothing at all

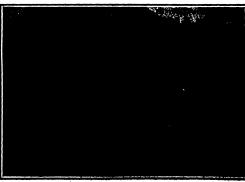
The accompanying illustration shows a bridge of this class of the bow-string type which was recently built in Canada. It has a span of 80 feet and provides a clear roadway 16 feet wide. The total weight is about 160 tons, and it contains about 19 tons of reinforcement in the form of plates and round rods.

The bridge was designed to corry a load of one bundred pounds per

square foot evenly distributed, and it was tested for this load with an additional load of 35 tons represented by a herd of 70 cattle

On the score of appearance it must be conceded that the design is decidedly pleasing the intersection of the balustrade with the chord and web members having been worked out with considerable taste. The structure spans the Etobicoke River, in the counties of York and Peel, Canada

No sooner had the first modest attempts to steer



. A RELEPORORD CONCRETE BRIDGE OF ARTHUR DESIGN.

ships by serial electric waves b or less success, than endeavors were made to direct the course of balloons and seroplanes in the same manner. The American engineer Anthony has made experiments off Sandy Hook, with a small unmanned dirigible balloon, which he succeeded in guiding more than a mile seaward and bringing back to the point of departure Prof Wiechert suggests the employment of departure Prof Wiechert suggests the employment of unmanned aeropianes for the study of atmospheric electricity and has designed an apparatus of this kind It is obvious that such an apparatus, equipped with

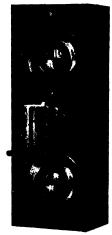
the necessary instruments, which could be sent to which could be sent to great heights without dan-ger and brought back with certainty, would be much more useful for the study of the atmosphere, as especially that of atmo and pheric electricity, then unanned registering manned regardering mar-loons, the recovery of which is always a matter of chance, or manned bal-loons and kites, the use with danger in storms weather Balloops con-trolled from a distance by electric waves would also be very useful in the res-cue of shipwrecked per-sons and for many military and other purposes. But -and this objection applies also to the wireless direction of ships and torpodoss—it is a long step from successful sorep from successful co-eriments in terorable con-litions to apitions suc-

## Instrument for Detecting Violations of the Speed Laws

BY L. GORDON GLAZIER

A very ingenious instrument for recording the speed and license number of an automobile has been devined by two instructors of the Massachusetts institute of Technology The instrument, which is but little larger than a pocket kodak, consists of a double camera with a watch movement which controls the consensus of the camera but the ca

nmera with a watch movement which controls the peration of the camera shutter When an automobile passes at a speed that seems committee, the operator trains the instruments upon and releases the mechanism by pressing a button, manediately the shutter of the upper camera is sprung



DOUBLE CAMERA WITH WHICH VIOLATIONS OF THE SPEED LAWS ARE DETECTED.

taking a photograph of the receding automobile, and a moment later the other shutter is sprung, taking a second image of the automobile, whereupon the timing mechanism comes to a stop. The plate is developed by the regular process, and the resulting negative shows an image of the automobile near the operator with its license number distinct, and a second view with the include taken at the end of the time interval.

In the center of the print are the photographs of the hands of the stop watch caught when the first and second exposures were made.

Since the automobile has traversed a certain space.

in the time interval, the second image is smaller than the first by an amount which can easily be measured with an ordinary scale, divided in bundredths of a lach; and knowing that the standard whoel tread is 56 inches, the distances of the two objects from the 55 inches, the distances of the two objects from the camera and hence the space the automobile has covered in the time interval is easily found by the following law The distance of any object from the lens is as many times greater than the focal distance of the camera as the length of any line of the real object is greater than its length in the photograph. This is a simple proportion in which three of the terms are known namely, the size of the object the size of the image of the object on the plate, and the distance of the image from the lens. The fourth term of the proportion, the distance of the object from the lens, follows by simple division However, the operator is saved all irksome computation by a table attached

to the instrument

To overcome the possible objection by the courts,
the watch has been designed so that the operator of the instrument may actually see it during the process of taking the picture. This is made nossible by sim ply boring a hole from the outside of the camera box to the back of the watch, which brings to view a dial around which travels a band attached to the same pinion or staff as the regular band of the watch in order to see this disl more plainly, two mirrors have been placed permanently in such a manner as to illuminate it.

The instrument gives extremely accurate results, and can be calibrated from time to time on objects of

The inventors believe that the instrument should be welcomed by autoists as well as police It is an im-partial judge the personal element being entirely eliminated A motorist who has been stopped does eliminated A motorest who has been stopped on not have to rely on an officers estimate of the speed, nor on the speed claimed by the officers operating a trap by means of stop watch and signals. Someon of motorists are fighting tases every day who honestly believe that they were not overspeeding when stopped. They would be perfectly willing to just their fines it convicted they were violating the law. Even stopped They would be perfectly willing to gave their fines if courtneed they were violating the law. Even where the more rational view is taken that the speed alone shall not determine whether or not a man is violating the law, but that the speed taken in connection with the surroundings shall determine it it is tion with the surroundings shall determine it it is atways a question of the officers' word against the autolat's as to surroundings. This photographic speed more the automobile whether people were crossing the street, whether it was more than ordinarily dan-grouns to run at the speed indicated, or more than ordinarily safe. A great advantage of the instrument is that it rec-

A great advantage of the instrument is that it re-ords speed over a short distance in the congested portions of cities, near crowded cross atreets and in similar situations, it offers the only existing method of measuring momentary bursts of speed The record of any reckless driver can be easily obtained and a print sent directly to him, when he cannot deny the evidence of his own eyes, and in many cases an ar rest will not be necessary, as the offense will not be

Regarding the legality of this speed recorder in a recent case that was strongly contested Judge Ham

mond of the Massachusetts Supreme Court said "The result of the evidence did not depend upon the fluctuations of human agencies nor on conditions where relations to results were uncertain, but upon the immutable working of natural laws, and upon the



SPEED OF AN AUTOMOBILE SHOW COMSECUTIVE PROTOGRAPHS

evidence the presiding judge may well have four that such experiments were likely to be more reliab as to the speed of the automobile than the conjectural ent of an eyewitness or the interested

## Sacrificial Compliments Paid to New Hulldings in Antiquity. A superstition that still envelops a great part of th

earth is that especial firmness may be given to a build-ing and that it may be protected from hostile infuing and that it may be protected from heetile infla-ences by inclosing a living creature, preferably a ha-man being, in one of the valle of the building itself. This belief, which is particularly prevalent in the Bulkan peninsula and, for instance, has given to the Roumanian Queen, Carmon Styre, Rabertal for one of her most beautiful folk takes, has not been known as baving had any hold in Italy hithestro Recently, in having had any hold in Italy hitherto Recently, the the course of archaeological research, it was found that in the foundation of the Tumple of Fortune in Feunpell there was a holden space in which nothing other than the shall of a tortoise was found which time had breish not four prices. Here, conceptently, was pred of the practice immurement of a tortoise, which was eshamed by the disposition of the square holden of stone of the creature's prince. In Italy this superstition may have peaced at an early day into oblivious, as the smeatice of human beings was forwign to the Roman rediging and was preduced containabily and yearly engine, being and was preduced containabily and yearly engine, being many the contained of the state of the st

believed that in old Greece also the sarrificial com-pliment to new buildings was not unknown instances of this kind of sacrifice in antiquity are certainly not frequent, all those of which we have any knowledge are or time aims or sacrines in antiquity are certainly not frequent, all those of which we have any knowledge are attributed to the Greek Orient. Usually a maiden was sacrificed who, at the same time, became the guardian apirit of the structure For this reason Trajan effected appril of the arrector For this reason trains encoure the erection in the theater at Antiche of the statue of the girl who has been sacrificed on the occasion of the reconstruction of the city after an earthquake and was designated as Tychs, the Goddess of Fortune of the scene of her sacrifics. It is this ides which still lies to-day at the root of this superstition of sacrificial co pliment. Solidly a human being is incased in a wall of a bouse or other building, so that its soul may live in the structure and nover escape from it. At the in the structure and never occape from it. At the present day a ricefrois sacrifice takes the place of such immolation. The human sacrifice is practiced appelluishing the measure of a person, or of the shadow, and immoring the string representing the measure or by innealing in the wall as animal siready killed or still alive. Manifesty the work of the proposed of the present of

When death is caused by hanging what propor when death is caused by analying war proper-tion does the pull to which the rope is subjected dur-ing the struggles of the victim bear to the weight of the body? This novel question has been asked and answered by experiment by Dr Angelo de Dominicia. answered by experiment by Dr. Angelo do Dominicke. The testion in such case was measured by a dynamo-meter attached to the rope. A living dog, suspended in such a manner that it remained quiet certified as pull of 20 pounds, but the subsequent "hanging of the same animal produced a pull of 42 pounds. With a larger animal the corresponding tensions were 50 pounds and 103 pounds.

Hence it appears that the convulsive movements of the victim may increase the tension of the rope to more than twice the weight of the body. This result explains the occurrence in the bodies of persons killed by hanging of serious lesions which it would be dif Scult or impossible to produce by hanging up a corpse. The strength of the rope must size be taken into account. If a body is found suspended by a rope the breaking strength of which is little greater than the weight of the corpus, it may fairly be inferred that the body was not suspended until after death Hence the experiments furnish valuable data for determining the cause of death in such cases and will pumbably be made use of in some future detective story.

## JUPITER AND HIS SATELLITE

### BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE

Jupiter and his satellites comma supers and his satellites command expects attention at the present time, owing to the fact that this greatest of all the planets and second only to Venus in brilliancy, is approaching opposition which will be reached on March 30th Jupiter will then be

be reached on March 30th Jupiler will then be both morning and ovening stars are The comparatively recent increase in the number of Jupiter's accellities from four to seven and pos-sibly eight as revealed by the growing power of the telescope directs the attronomers curi one scrattin upon the Jovian system. The

satellite which is nearest the planet revolves around its great primary in the short space around magnat primary in the short space of twelve hours, at a distance of only 88,400 miles from the surface, while the outer most moon shows its extreme remoteness from its center of attraction the enormous distance of 7430000 miles) by a revoludistance of 7.430.000 miles) by a revolu-tion requiring 256 days. Thus is exempli-fied a perfect conformity to Keplers laws. A small magnifying power reveals the elliptic outlin of Jupiter, whose polar depression is a reput y marked the equatorial and polar diam-eters showing a difference of over 5000 miles.

in the plot of the orbit Jupiter's position is in the plot of the orbit Jupifer's position is shown for the date of coposition, which is very near sphellon, also for the oppositions from 1902 to 1911 inclusive The-average interval between oppositions in 339 days, But, in obsolutors to Keyher a second law, the planate velocity at sphellon is distributed by the curred or Provengy 21th, 1908, and the next will occur on April 30th, 1911 At perihelion the voicity was accelerated in the date of the opposit tions, which occurred before and after the holion passage were respectively September 11th, 1903 and October 18th 1904

The five inner satellites revolve in orbits whose planes very nearly coincide with that of Jupiters equator This plane forms a small angle with the ecliptic, and may be represented approximately by a straight line (Fig 1) The distances from Jupiter to the satellites are represented by the same scale as the planet. It is impossible to show the positions of the two outer satellites by this scale within the limits of this page, since their distances from Jupiter

of this page, since their distances from Jupit are over six times the between the plant at Calliste. It should be noted that all t satellites are negar, on the same side of the planet at the same time, as shown in the figure. This view of the satellites orbits is obtained when Jupiter reaches the positions. A and B shown in the plot of the orbit. When Jupiter is near either of these points, the five satellites appear to move back and forth in straight lines, and at every revolution of each satellite there is alternately a transit across Jupiters alternately a transit across Jupiters and disk and an occulation by the planet. Fig 1 shows Jupiter and the orbits as each from the earth in 1908 in 1902 this figure was reversed During Jupiter's revolution around the sun in 1185 years, the planet and the satellittes are continually changing their positions retailing the continually changing their positions of the orbit is incited at an angle of 13 dee, and that next which that per which the property of 12 dee, and that next which the planet in the planet. of 13 deg, and that part which is above the ecliptic is represented by the full line. The line joining the points N and N. (the ascending and descending nodes) is the intersec-tion of the plane of the planet s orbit with that of the ecliptic In Plot 1 a visual ray A from the earth tan-gent to the planet shows that, seen

and to be placed on the control of t

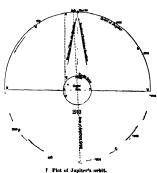
the satellites the general directions of the lines of vision from the earth before and after opposition are indicated by arrows.

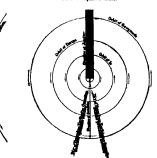
Obviously the planet does not occupy the same

position in its orbit as that shown in the plot before and after opposition. But if this page be rotated clockwise and counter clockwise through small angles, one position will represent Jupiter in his orbit before and the other that after opposition Before opposition



Relative positions of Califoto, Jupiter and the Karth.





11. Plot of Juniter's orbit and of his autolities' orbits JUDITER AND MIS SATELLIPES.

tion it is clear that the transit of the astellite's tion it is clear that the transit of the satellite's shadow precedes that of the satellite, and after oppo-sition the satellite precedes the shadow For example: (saymed's shadow cressed Tuptier's disk or Jass-ary 7th between the hours of 16 h 46 m, and 17 h. 31 m. (W M T) The shadow was clear of the phanot before the transit of the satellite communes two hours and twenty minutes later On June 20th the same satellite will cross Juniter's disk between the same antilitie will cross Jupiter's disk between the hours 2 h 5 m and 11 h 27 m; and the shellow will follow 2 hours and 27 minutes later Whee a smallille passes into the shelvor of its primary, it is described as "sulpass." The dates of the transitie of the satisfies and their shedown, and of the sulpass and occultations, and given in the Nantina-tantane for the months. For each quotile before, and

after conjunction (October 18th) when Jupitar's proximity to the sua will be too close for observation, the phenomena of the satisfitze are omitted. Observations of the occutations of Jupitar's mode-line provide a valuable means for verifying the velocity of light. As the earth recedes from Jupitar after opposition, an occultation is observed to occur after a longer interval of time than that which would

after a longer interval of time than that which would elapse if the planets were separated by a constant distance, and after conjunction, when the earth is approaching Jupiter, the intervals are observed to diminish Light crosses the earth's critic in a little less than a thousand

185,800,000 == 16 m. 87 s. At the

186,230 date of opposition this year Jupiter's dis-tance from the earth is 413,5 million miles. Occultation of a satellite at this distance

418,500,000

or 87 minutes after its occurrence. The points of and 7 are respectively the positions of Jupiter and the sarch at the same date when the projection on the planes of the cellptic of the fine connecting the planes is parallel to that of March 30th At the second data, when the earth is at i, observation of a phenomenon of Jupiter's smidlites occurred inter than would be the case if the earth remained at the constant distance (see Free 2 Jupiter, and the difference in this at that represented by the interval is, or

of - × 997 seconds.

A comparison of the earth and moon with Jupiter's satellite system is shown in Figs. 1 and 2, which are drawn to the same scale. The moon's distance from the earth does not differ moon's distance from the earth does not differ very much from 10°s distance from Unpiler The revolution of the latter is accomplished in 177 days, and of the former in 27 35 days. If 10°s distance were reduced to correspond with that of the composition of the sarch, the period of the activities of the composition of the planet's activities and the planet's actilities more interesting the sarch their orbits in coposition to the great country from the planet's actilities make actilities make ractilities make ractilities the planet's actilities make ractilities make ractilities the planet's actilities make ractilities make ractilities make ractilities the planet's actilities make actilities make ractilities the planet's actilities actilities

diameters of satellites V. VI. and VII are not given. They are too small for accurate measurement, the diam-eters ranging from 50 to 100 miles.

JUPITER'S SATELLITES.

| Назве  | Distance,<br>Miles,   | Period,<br>Days.                              | Dismeter,<br>Mries.          |  |  |
|--|---|---|------------------------------|--|--|
| V<br>Io<br>Baropa<br>Ganymede,<br>Callisto,<br>VI<br>VII | 118,800<br>961,000<br>415,800<br>bed,000<br>1,167,000<br>7,186,000<br>7,468,000 | 0 5<br>1 77<br>2.85<br>7 15<br>18 60<br>255 4 | 1100<br>1100<br>1100<br>1100 |  |  |

That the controlling devices for a single-phase car equipment need not be more complicated than for a direct-current car, states the Electrical World, will be apparent at once from the fact that any of the methfrom the fact that any of the method on now used with the lattice type of our can be applied immediately give the control of our can be applied immediately if a reflore that by selecting a suit-aby low value of rouldy B. M. Farmer of the famility arrisage ment of motors with rhosentate acceleration can be applied to series motors of the suited-phase type equally

plied to series motors or the single-passe type equaty, as satisfactority as to those of the direct-current type. Moroover, with the alternating-current equipment it is possible to substitute reactance coils for the residence of the rheostats, and thereby eliminate a considerable of the rheactait, and thereby eliminate a considerable portion of the seary dissipated as best in the embyd protion of the seary dissipated as best in the embyd circuits during acceleration. In addition, with the single-phase or favor can be obtained, convaniently, any desired number of rollages to be happened upon the motor circuits, and there is thus no bichmostly for limiting the E. M. F. to a single value, six sizes in deas with direct-current equipment, "be that limited one with direct-current equipment," but his limited with the control of the contr

#### A RESTARDANCE PROPERTY.

To the Believ of the Scussworth Aussours.

'I have just read with interest on page 128 of the Scussworth Aussours.

Showever the state of the interest on page 128 of the Scussworth Aussours of the "manarkable phenomenon" observed by Mr. V. J. Laine, in which a rainbow was spine to be disturbed after each past of thusder Mr. Laine's explanation, based upon the change of size of the rain-drops, is apparently unwarranted, inasmuch as according to the old and generally accepted optical per of the rainbow, the angular position of the and the observer's eye, is independent of the size of

and the observer's are, is independent of the size of the rank-drops.

To the writer the phenomenon is more plausibly are plained by recognizing the atmospheric distributance in the like of sight of the observer due to the funnderboil. The light, after dispersion by and reflection from the rain-drops, passes through air which is agitated by the concessions following the lightning strokes, and the latespace sound waves radiating therefrom. The result er to that seen over a hot surface, as a or heated field, where the convection currents distort

or heated field, where the convection currents distort the light rays towersing the overlying air. While it is true that ordinary sound waves do not affect the density of the air sufficiently to deviate the course of light perceptibly, the violent expansion and contraction accompanying a thunderbolt may pro-duce the result. The possibler circumstance in the case referred to it that the storm approached from the east, opposite to the sun, so that the lightning dis-carrant, which are somerally in the advance portion charges, which are somerally in the advance portion of the results of the contraction of the contraction of the contraction of the results of the contraction of the residuous whereas ordinarily when a rain-tion of the residuous whereas ordinarily when a rainconserver and between his eye and the apparent posi-tion of the rainbow, whereas ordinarily when a rain-bow is seen in the east it is after the storm has passed over and the lightning is taking place in the distance

#### THAT CURIOUS WATER PERSONNEON.

To the Editor of the SCIENTIFIC AMERICAN I observed a similar curious phenomen rted by James S. Lee in your issue of January reported by James B. Lee in your issue of January 50th Mine was observed from a train going west through the great Alkali Desert in Nevada. The desert floor is of sand, and fait, as though laid by water Innumerable desert or beach grass mounds covered perhaps ten per cent of all the surface. These

covered permaps our per cent or at the surrace. These mounds or dunes vary from six to twenty feet in diameter by one to two feet high it was about five o clock of a warm Beptember afternoon I noticed, looking wastward and nearby, what seemed to be a small but powerful stream of water or fountain, going to perhaps twenty-five feet in height. Close observation revealed many hun-dreds of these fountains. As near as I could make drads of those fountains. As near as I could make ut there was one from the center of such of the sand dunes, varying in size much as the annd dunes varied in area. These fountains were really formed by incipient cycloses carrying annd, not water, in small streams, somewhat in the shape of slender long-waisted hourglasses, spreading at the top to full to search. These varied from twenty to fifty feet bigh. The truit was making the small rather slow desert time, which gave a full chance for observation. continued for ten miles along the line What caused than? I suppose the floor of the desert was severa thesn? I suppose the floor of the desert was several degrees cooler than the sand dues, which had been absorbing solar heat rapidly all day As evenings, approached, the warmer air over the dunes reservablely, assuming the natural spiral motion, licked up warm dry sand, and made a most heautiful ple-ture. The passengers gased and wonderd why. Will the Ridder please give the correct cause if mine, as given, is incorrect?

ROY T KIMBATA San Francisco, Cal.

WANTED: AN RESOTRICAL APPARATOR FOR LOCATING

CURREN TRANSPAR.

To the Editor of the SCHWITH AMERICAN
I have been unsuccessful in finding in Engiand any
manufacturer of an improvement upon the under
water electrical ore-finding apparatus originally desurfied in the Suppresent of your paper dated Jaanary 20th, 1904.

serviced in the government of your places of the parties of the pa

### Scientific American

of the apparatus, to show that it could fulfill the working conditions necessary I would also like to know the cost of the instrument.

KERRETH MACKEREIN FORS, Lieutenant Colonel London, S. W

The Whop of Satura.

In a recent bulletin, Prof Percival Lewell of Flagand a recent bulletin, Prof Percival Lewell of Flagstaff, Aria, annouese that on Beptember 19th, 1909,
in examining Satura he noticed what seemed to be
faint lacings traversing diagnostly the planer's equatorial helt Not only was the phenomenon unprecedented, but it was no faint and illustre that he
was unable at first to assure himself of its objective
reality. On mentioning his impressions to his assistant, Mr. E. C. Silpher, he found to his our place
but the season of the contract of t

he had had suspected or the same thing on september sit, and had even thought to detect traces of it on the photographs of Saturn taken by him afterward on that day At the same time that Lowell divined rather than described the wings be saw unmistakably a fine dark irregular line running longitudinally through the middle of the bright equatorial belt, a line not of uniform character, but as if composed of

the not of uniform character, but as it composed or beads strung upon a wire. Following up the eye-high thing vouchsafed he exam-ined the equatorial belt for the wisps at moments of good definition during the succeeding days. Re-peated observation of them, both by him and his aspeaces opervation of them, soon by him and his as-sistant, eventually showed them to be facts, and then, to clinch the matter, he succeeded in getting, on No-vamber 4th, some excellent photographs of the planet in which they stood recorded, appearing in sits in suc

in which they stood recorded, appearing its after in suc-centry images on the same plain.

The manner in which the photographs are taken anables ones to eliminate on the images imperfections due the appearatus from the more drawn than the day of the vertically for the accessive images, but the colorsecreen through which the photographing is done is itself shifted at intervals during the taken of the plate. Nothing due to either cause could, therefore, perpentant itself is ails on images of the set some distance apart.

On the photographs plate the images appear east uy as they do to the eye, though of course not so well defined, to wit as wisps or filaments, fainter than the dark beits of the planet's disk, crossing the bright equatorial beit. Like all astronomic phenomena previously unperceived, they became much easier to catch after their research was known, their recomplicions. lously unperceived, they became much casier to catch after their presence was known, their recognition not being nearly so difficult as their discovery. Their apparent lack of contrast with their surroundings is for much in this, which is also why the photographs which intensity contrast brought them out. In look the inclinar resemble faint shreds of some dusty mustaters in the act of dropping, their shares of the pro-

quary substance in the act of dropping from points on one edge of the bright belt over to the other Though darker than the bright belt, they are much lighter than the dark belts from which they come a difference in tone which is probably due to their real sienderness being spread out by the light waves and so thinned in strength.

Careful accuting revealed that the wisps started from triangular spots in the dark belt, and Mr G R Agassis, who was observing with Prof. Lowell, detected that the adjacent parts of this belt were themselves erissercesed by derker lines. The triangular spots are not difficult, giving the edge of the belt in good seeing a notched or toothed appearance. It has not been possible as yet to use the wisps for timing the rotation periods of Saturn's equatorial region, owing chiefly to their number and the confusion consequent

receiving in their number and the confusion consequent pages it, but identification will undoubledly come in time and give us a more accurate value of the equa-torial agent dark was a present possess. Tainvanthy as the lacings are in themselves, they should cloudly as of firm this fact, that they aimset lyestledly plavallat the phenomena recently discovered on Jupiter, it has based on Except for Intim-ness, which flatures greater disasses, the one with factures is greater to the other. Like the Jovian, the wings seen to be hore- teamous jn the indigin of their quiese. Like the Jovian, apparatorial phagements, on, the shedial copy is more ofengiousus; than the wiste.

than the wisput. The Saturdian inclins cross the equatorial belt manality of an angle, but one which is less than that of the strenge of the Jorian ones. This angle should have something to my about the factors concerned in the formation of the two sets respectively; for analogy ja best explained by secondary difference.

---Official Metaerological Summary, New York, N. Y., Pobrusry, 1916.

Atthousherin pressure Highest, 20.73, lowest,

Atmospheric pressure Highs 29 43; mean, 30 12 Temperature 

temperature of February, 40, in 1897; coldest mean, 33, in 1875-1885. Absolute maximum and minimum of February for 40 years, 69 and — 6 Average dally cooses since January 1st, 14 Procipitation 407. excess since January 1st, 14 Precipitation 407, greatest, 157, date, 28th, average for February for 40 years, 3.80 Accumulated excess since January 1st, 208 Greatest precipitation, 7.81, in 1893 least, 0.82, in 1895 Wind Prevailing direction, West, total in 185 Wind Prevailing direction. West, total novement, \$470 miles, average heart reviewly, total novement, \$470 miles, average heart reviewly, total novement, \$470 miles, \$4 wmm. remaire numitity, 65.5 Sleet, 9th, 12th Denne fog 12th. Mean temperature for the winter, 3173, normal, 3180, deficiency, 007 Precipitation for the winter 1488, normal, 1103 Excess, 365 Total smowfall for the winter, 337

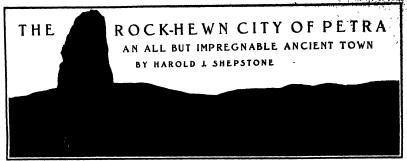
Ephomeria of Comet A 1910. Raphemeria of Comet A 1910, A letter has been received at Harvard from Capt. T. E. De Witt Veeder, Superintendent U S Naval Observatory, giving the following elliptic elements and ophameris of Comet A 1910, computed by Prof. H. E.

Morgan
"Numerous direct solutions having falled, the
"distances for Washington observations Jahuary 25th
and February 4th were varied to get the following
eigments. A slight change in the elements carries the comet near Mercury January 19th, and near Mars last

The Current Supplement

A new process for reducing atmospheric nitrogen, invented by Dr. Schonherr is described in the opening article of the current Supplement No. 1784. Among the present wonders of science none stirs the imagin ation so powerfully as the doctrine that some forms of insanity are the result of a chemical change in the blood. The theory is elaborately discussed in an article ontitled, 'The Chemistry of Insanity''. The article ontitied. The Chemistry of insanity recent development of acronautics has suddenly creative a demand for large quantities of hydrogen at a low price. The subject is considered in a short article famil Kosatk writes an article on spaking magnets, speaking iron, and speaking wire. Since the experimental bombardment of the "Belle Isle" of the British have been directed against a warship in any foreign navy as those of which the French warship "Jena" was the subject last year. An elaborate article by a competent authority gives the results of the tests. W P Dreaper exhaustively reviews the artificial silk industry. One of the most recent important events in the field of prehistoric archeology was the discovery of a megalithic monument of remarkable size ery of a meganitate monument of remainance also be Biacoglie Italy This subject is discussed in an illus-irated article. In the middle ages falcony, or hawk-ing, was regarded as the king of sports, as it was the sport of kings. The origin and development of this obsolete form of hunting is discussed by Dr. Hans-Bollmer in an article entitled ' Fakoury in the Middle Bollines in an article entitled "suitorly in the shown Ages" Perhaps the most distinguished authority on the subject of previous stones in Germany is Prof. M Bauer of Marburg He contributes an exhaustive article on artificial stones which contains a wealth of sechnical information. The process of directly producing ammonia from coke-oven gas is described. Bince Davy, nearly a century ago, constructed the Since Davy, nearly a century ago, constructed the first safety langua, inventors atmost immunerable here produced lamps bearing their names but in the tiga-lority of instances the alleged improvements have been more apparent than real. A comparative est-mate of the safety of these various forms of mineral lamps is presented by J B Marsaul F W Henkel contributes an article on astronomy and astrology, in which he riddles the supposed influence of the planets upon human affairs

After three successful flights on March 2nd, Lieut B. D. Foulois in a Wright aeroplans, made a fourth attempt at San Antonio which resulted disastrously dder of the machine was wrecked and Lieut The router of the marsine was wrecked and their Poulois had a narrow escape from futry. The ma chile had just turned the southern end of the parade field at Fort Sam Houston when the engine stopped The aeroplane fell forty feet to the ground



The rock-hown obelisks of Petra.

a view is taken high up to the worth of the narrow velley called the Walry Mones (the Vale of Mones) in which the failmone rock-ent city of Peter reposed in accient times, securely shot in from stateth of the midwest times. It is row when the reason have been used with invested he was not been accessed in the control of the control of the fail to the peter of the Mones in the control of the Mones and the peter of the Mones and the peter of them. They are accessed by English per deposition of the control of the peter of

Unique among the many wonders of the Orlent and the remains of heary elvillation stands Petra the rock hewn (ity the city so graphically addressed by the prophet as Thou that dweller in the ciefu of the rock, whose habitation is high (Oland 4), and re-ferred to in the challenge of the Palmist (69 2) "Who will bring me into the strong city." Who will of the creak Acabiac desert. About midway between of the creak Acabiac desert. About midway between of the great Arabian desert about midway between the Gulf of Akabah and the Dead Sea. Other ruins such as Palmyra and Basiber, show crumbling piles of magnificent architectural monuments but in Petra, high up among the mountain crags that sentine it, are temples theaters, tombs, and other structures, strong and indestructible, standing almost as perfect as when they were chiscled out of the living rock of which they still form a part

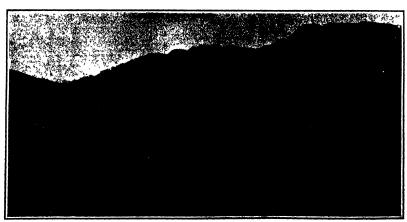
These ruins (if ruins they may be called) that lenge admiration by the variety of styles they em-body, showing, in the most ancient creations early body, showing, in the most ancient reastions early mative art intermixed with Egyptian and in the later magnifecent edifices the best types of Greek and Roman architecture, and by the exquisite hues of the sandatone from which they were hewn, varying from sangkone from which they were news, waying note the prevailing purplish red of the mountains and eliffs to the delicate pink and rose color of some strats, and the white crimson yellow and blue-ribboned veins in other places, rivaling the softness of

the plumage of birds or the pelase of flowers.

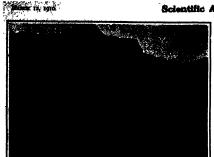
Petra, so long inaccessible because of its removers and the danger from roring Bedoutas, may now be reached by a six hours' ride westward toward the Arabah from Bi Mann, a station on the new Meca railroad Prof Gustar Dainan, director of the German Archeological School of Jerusalem and the suthor of a monumental work on Petra, has just paid another wist to this aware of his former applorations, in which the state of the state of the state of the state of the control of the other pelocity of the state of the former applorations, in which can critony in Jerusalem, who secured a number of abootsquale to these majeries rains, some of the most striking of which we here reproduce for our readors

Petra positing amid its precipices and cliffs almost in the shadow of Mount Hor, called by the natives
Jebei Harun (Aaron) from the tradition that it was
here on the top of the mount that Aaron died, is aphere on the top of the mount that Aaron sited, is ap-proachable only from the east through a deep and narrow desire which the little stream of the Wany Musa bas in past ages out for theelf in the red sand stone. The correct opens in one place to about two miles in width for a distance of about a mile, and miles in which for a distance of about a mile, and here, protected by mountains and precipiese on every ride, this remarkable town lay secure from attack from without it was its impremable position and its being on the great caravan route to the Red Sea from the north that gave it the importance it had as

a trade depot and stopping place The approach was beneath a grand arched portal at the mouth of the Sik (as the deep ravine is called), some romains of the portal being attll visible. It takes half an hour to follow the windings of the narrow path al dark ravine, which is only from 10 to 20 feet wide, threading the course of the oleander fringed stream bed until one emerges into the small open valley The variegated sandstone rocks rise precipitately on eit ting out the light of day. One of our views shows the entrance to the Sik. Another is taken about twenty minutes in from the opening, giving a good idea of the narrowness of the defile and the precipitousness of the rock walls, while beyond, where the gorge of the rock walls, while beyond, where the gorge widens a little, are seen the seviptored columns of the magnificent so-called Khannet e! Farfount (the Interest of the rock hewn mousunests of Petra being place in AD 131 and retacted here a toughe to late. Another of our photographs shows this impossing structure, while is justic yearded as one of the woo ders of the East The rock wall from which it is described in the properties of the season of row above the other, with niches in which are rock



SEC, or death, in pearly two tolles long. Curved with matchines shift, after the conception of come picoter mand; producing the besteless of the acrosses, the purchase been of the candedana, the trivesting disks, the imperation virtues, the billions atmosphere, and the trapposed of bires sky above, the disk unique



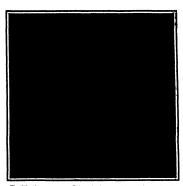


The theater among the reck-cut rains of Petra.

Ed Ber, one of the most remarkable of the temples and tombs of Petra.

hewn equestrian and other statues the whole terminating above in a miniature of the control of the control of the height being about 65 feet Within the bars lofty room and some chambers. A short distance boyond one emerges into the mountain guarded valley in which the city lay, mound of debri marking the sites of the former homes of the days being sentianted at from forty to days being estimated at from forty to eighty thousand souls. The rock hewn structures chiseled in the precipitous structures eniscied in the precipitous cliffs on every side were public buildings and tombs rather than dwellings. Just on the left, as the valley is entered is the wast rock-cut theater in semicircular form. vast rock-cut theater in semicircular form, capable of holding 3 900 spectators. Here the workmanship is Greek. There are thirty-three tiers of seats. In this locality are some of the oldest tombs, including detached pylons. Many of the oldest tombs were cut away when the theater was hewn out of the mountain side. One of our photographs is of the theater

photographs is of the theater Standing in this small open valley one sees the façades of tombs and temples of many styles and dimensions with many niches for voltwe offerings. They are at all elevations, many low down on the mountain side, and others high up in the cliffs, with stairways cut in the rock to



The Sik, the extrance to Petra, the impregnable rock-hewn city of antiquity.

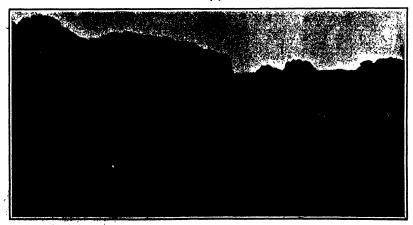
reach them While most of them stand out conspicuously others are hidden in the mountain recesses and lateral valloys flow cloquent are these silent pylons and obeliaks of Kdom and Egypt, and these columns and capitals of Greece and Rome! What diverse peoples these tombs have looked down upon when living and given reach them. While most of them stand out looked down upon when living and given sepulture to when dead. And how many different religions have been represented by ministering priests at these shrines! One of our photographs is of a tomb or temple in three shorles cut out of the

temple in three stories cut out of the mountain wall on the east and showing a succession of similar buildings beyond The façade of this tomb is not like most of the others in imitation of a temple, but of a lordly palace and it has been erably damaged

erably damaged
On the opposite side of the valley to the
west stand the reusins of a masoury cellfiee called by the nalives Kare Parious
(the Castle of Pharnoh), of which we also
give a photograph it was a Roman
heathn temple
Behind the Kare Parious a rock-cut
stairwas leads up the rugged hill of the
Arropolis to the Place of Sertiles with its

altars, pool, and court, all hewn out of the living rock. This was a typical holy place, or "high place," of the primitive

(Concluded on page 427)



to summits present Nature in her wildest and most service forms, and ations of your sout will be the memories of this silent, besetful "ross-rail

2020a; an arcibit cute garved gov of a mountain of sandotone and entered by a mysterious rift two miles loss.

## AN ELECTRICAL FEVER RECORDE

BY DR ALFRED GRADENWITZ

Fever, 1 e , the rise in blood temperature attending certain malades is known to be the outcome of a spontaneous reaction on the part of the body against the microbes invading it the opinion is therefore, erroneous that fever is all cases should be acted against in order thus to subdue the morbid state of the patient Nevertheless it is of the highest import-ance that the physician be kept informed of the variable temperature of the blood

According to present practice temporature readings are taken at regular intervals, say there or four times a day by a sonal tise thermometer. This practice obviously alives no information as to those oscillations in temperature which may have occurred in the meantime and which, in some cases, it would be desirable to know A process allowing this important factor to be recorrect continuate and content full. These corded continually and automatically there for is worthy of universal attention. A firm of Berlin constructors, Mesers Siemens & Halske, have recently perfected an apour tus achieving this result

par the achieving this result. The apparatus is based on a very simple principle viz the alteration in the electrical resistance of platinum wire by variations in temperature. It comperises in addition to a coll of platinum wire a Wheatstone bridge and a self record

The platinum coll is either introduced into some cavition of the body or fixed on the body couble conductor of low resistance connects the coll

cultule induleror of low respirator commerts the cult with the bridge and millivolinator, which reversia any variations in the resistance of the platitum wire and accordingly the temperature of the body. The current required to feed the apparatus is sup-plied by a small storage battery of four volts, the gradual drop in tension being compensated for in a simple manner by means of a testing and regulating resistance with coarse and fine adjustment. As the remander with coarse and me adjustment. As the normal range of the recording apparatus comprises the interval be-

45 deg C the curves registered are of sufficient are of summetent distinctness for any therapoutical and scientific purpose The electrical

fever recorder is constructed in two different type In the first

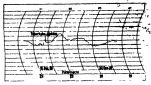
type, the rotating voltmeter is sus-pended from a strip of metal, the curve being recorded on a paper tape about 45 meters in length which is moved along by a clockwork at a speed of 20 millimeters per hour The useful width of the tape is 120 millimeters low the paper tape there moves der the action of a clockwork an luking rib-bon, over which oscillates a point-er carrying at its end a runner The position of the pointer in marked by a dot series of points

forms a distinct

The clockwork should be wound up once a week, a new paper roll being inserted every three

The second type comprises a notary coll located The second type comprises a rough continuent between points, so that the apparatus to insensitive to any moderate oscillations while not requiring accurate horizontal adjustment. The registering tapo

is wound together with a sheet of carbon paper round a drum. As in the former apparatus, a style marks time. The apparatus is designed either for a rotation of the drum (about 360 millimeters in periphery) is about 7 days or in 24 hours. The paper tape and carbon should be exchanged after each turn, which The dropping of the



Record obtained with fever recorder, showing effect of tubriculla ignition

in accordance with the rotation speed of the drum. and takes place either every 12 or every 2 minutes in order to allow for both speeds, the apparatus can be fitted with two drums, exchanged against each other by a simple manipulation. The useful width of the paper tape in this case is about 80 millimeters ! o, somewhat less than in connection with the former type This is why the one is generally used for accurate, scientific investigations and the latter for ordinary clinical apparatus

#### Tressure Hunting.

The United States Hydrographic Bureau and Coast Survey has charts of the Great Lakes and the Atlan fic and Pacific, coasts which are consulted eagerly by

not so generally prised by the lest. On the Great Lakes alone one of wrecks are chi tain many millions of dollars in b and ore. There is no vague uncorand one. I never he no vague ancertainty about these treasures. They were known to exist in the holds of the ships, and no man has yet been able to recover them. The steamer "Pewable," for instance, which went down in Lake Huron in a storm in went down in lake flured in a morin in 1865 carried with her half a million del-lars worth of copper from the Lake Super-lor mines. For three decades expeditions sought to find the wreck, and finally it was

located about six miles southeast of Thunder Bay. But the wreck was in such deep water that only a rut the wreck was in such deep water that only a very small fraction of her carge was ever recovered Here is a submarino copper mine which might tempt the most adventurous soul to risk his life in gaining. The chart of wrecks on the Great Lakes compiled

ly the Hydrographic Bureau and Coast Survey shows the relative depth of water and this simp tels the whole story of why enterprising man has not been able to recover them Divers seeking treasures in sunken vessels have learned that anything which lies much more than 100 feet deep is very difficult, if not absolutely impossible to recover The pressure of the water beyond that depth becomes so great that diving suits are apt to collapse and crush the wearer We know from a study of the charts that bundreds

of ships leaded with tressures have sunk in wa ter ranging from 100 to 250 feet in depth and if div ing suits could be stand the ener mous water presest depth and enable the diver to work easily, enormous fortunes could be quickly made The whole his-

hunting under the water has been marked by man's futile of-fort to fight against the pres-sure at great depths. One hundred feet the surfa the see, the presdivine inflated



AN ELECTRICAL DEVICE WHICH RECORDS A PATIENTS TEMPERATURE FOR SYRET MINUTE OF THE DAY AND MIGHT.

a large class of advanturers and herd, practical most of business and scionos, who are indevented; in the recovery of lock wealth liceopal imported methods of deepess diving and wrecking. These charts are simple and ununorassity in appearance, pld might sensity be mistaken for ordinary roast obsate with here said there dots to represent subscarped reads or profits, but

100-foot mark. For instance "Pewable" was located in Lake 100-root man.
"Fewahle" was located in Lake passes.
Toledo, Ohio, went down to inspect it, and it up dead The stammer was in a depth opportunizating 200 feet Two other deveil few years not the same fals. In 1893 (it (Ouglinued on page 201).

# *Department*

#### BOUGH-MIXING APPARATUS

Pictured in the acc vice adapted more particularly for kneeding dough, but which is also applicable for mixing, stirring, or charaing any material for household or culinary



DOUGH-MINING APPARATUS.

purposes. The machine comprises an approximately rectangular reseputate A formed, however, with a curred bottom, and an outer casing B, which acts as a support for the receptacle I from the will be defined as a support for the receptacle I'm end walls of this mixing machine are provided with journal bearings, in one of which a crank handle of its supported bearings, in one of which a crank handle and the survive one end of a spirally curved altirer binde if The opposite end of the stirrer binde is formed with a threaded him into which as extension of the crank handle and it sorrewed discovered providing area or curred fingers. It the object of which is to extend the material that is not properly altred and mixed by the main sitter binds. In use as the crank handle is turned, the fingers tend to feed the material toward the content, so that it is fully acted upon by the mass. turned, the fingers tend to feed the material loward the center, so that it is fully attend upon by the main blade. We are informed that in practice this type of silver kneeds and mixed the dought theredgathy and evenly in a comparatively abort time. By holding the stirrer blade and turning the crank in a revener di-rection, the latter will be unserwerd from the hub-st of the control of the silver blade may be re-moved from the recollecte. A pattern on this mixtus mechanism has been granted to left danier E. Ray of McClonnellaburg, Pa.

### IMPROVED STEP LABOUR.

INFROVED STEP 1.505ER.

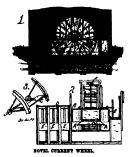
In the SCHETTIVE AMERICAN ON November 14th, 1908, we published a description of a collapsible step lack of the step of the ste The ladder is collapsed by swinging one side against the other, but normally the rails are held apart by means of a diagonal brace, such as shown on the lower section of the ladder. The steps U of the ladder are hinged to one of the side-rails as shown in Fig. 2, while at the opposite side they are provided



#### Schotific American

with brackets D, in which are alots edapted to engage hinge prins secured in the side-rails A. This side and pin connection provides the necessary play when the ladder is collapsed. The pins on which the steps are hinged its at right angles to the rails A, and in order that the tread surface, may be horizontal. the steps are made of a substantially wedge shape, as indicated in the illustrations. The top or platform ### of the ladder is also hinged to the rails at the F of the ladder is also kinged to the ralls at the points FP, which ilso on an arise at right angles to the rails B TO support the ladder in its normal technical position, two lags G are provided The lags are connected by the usual links B to the rails A and at the supper mids they have accession pieces that shortes the index, those extension pieces with the shortes the index, those extension pieces with the upper rails B are withdrawn from their sockets. Then a top piece, such as indicated in Fig 2, is applied to the ladder, the four short legs of this problem is inserted in the slewes at the upper reside of the rails A. The language of the control of t and also through the legs of use top piece. In pre-vent the legs of from apreading too far they are re-tained by means of brace bars K. The links H in this case are unnecessary and are folded upon the serves, as indicated in Fig. 2. Mr William J. Birm-dell Box 182, Brooklyn, N. Y. is the inventor of this improved step ladder

A number of advantages are claimed for the wheel illustrated herewith namely that it does not require the use of dans, it regulates itself to the rise and fall of the stream, uses only the surface curre is equipped with feathering blades, and is provided with means for preventing the parts from freezing fast in cold weather. The water wheel is supported on pontoons, as indicated at A in the illustration.



The pontones are connected by means of links or parallel arms M to a fixed framework supported on parallel arms M to a fixed framework supported on the construction of the blades used on the wheel The spokes of the wheel arms parallel spokes of the wheel arms interested at their outer ends. The blades O are hissed to rods connecting the parallel spokes of any hissed to rods connecting the parallel spokes and have free play in the bifurcated portions have provided as very strong construction, and enables the that there is no litting of the water as in an ordinary blades to accommodate themselves to the current so that there is no lifting of the water as in an ordinary water wheel. It will be orident that as the water rices and fails, the wheel will rice and fail with it so that the blades will always extend to a uniform depth into the water However when the water rises the surface current is spit to be very swift, and it is necessary to reduce the flow past the wheel. This is effected as follows. On the up-stream side of the structure a wing D (Fig. 2) is built out diagonally structure a wing is (Fig. 2) is built out diagonally into the stream, so as to direct a large portion of the current between the pontoons and against the water wheel. In this wing are a number of flood gates N connected by means of ropes and pulleys to one of the pontoons A in such a way that as the water rises, the content of the pontoons A in such a way that as the water rises, the positions A in such a way that as the water ries, the gains will one, permitting the water from through them, and thus cutting down the current that strikes the wheel To protect the parts in cold weather, a casing is built over the wheel, at the top of which is a suction fan P This is belied to the wheel as shown in Fig 3 Through a dust of a current or warm air is conducted to the linetier of the casing, and thence is succled out of the top of the casing was the conducted to the linetier of the casing the means of the fine and delivered them, and proved the case of the ca

through the duot G The inventor of this improved water wheel is Mr W P Spooner, Box 3 "The Manse," Carlevale, Saskatchewan, Canada.

CAL-RYALBIES DEVICE FOR RAILWAY SURVEA.

In order to insure the safety of cars when rounding curves, and to prevent the car wheel flanges from
having under frictional engagement with the rails,
a safety mechanism has recently been invented, which pictured in the accompanying engraving It con sists of a central rail A, that is supported on the



METROD OF RETAINING CARS AT CURVES.

and is strongly braced by means of anchoring de vices B, which are imbedded in the ground and term-inate in plates C. The object of these plates is to prevent the anchoring devices from working upward. prevent the anchoring devices from working upwara.
The illustration shows a portion of a car truck passing over the rail A. The axies of the truck are connected by means of suxiliary trusses B, below the method by means of addition, these D. serve the main trusses, on which blocks A are supported De-signed to travel around these blocks B are endices chains P fitted with rollers The rollers are present by the blocks B against the guide rail A. As the truck passes round a curve the rollers tend to keep it in place. Ordinarily the forward wheel on the outside of the curve tends to bear against the rail, owing to the fact that it is rigidly connected with its mate on the other side of the curre, and beares it cannot travel faster than the latter. The result is that fange on the outer wheel is subjected to considerable may are the centering device here shown, however will present the fange of the outer wheel from being in duly pressed against the rails. The guide rail serves to present agreeding of the rails, and heeps the cars from leaving the track. The inventor is Robert Bel-dess of theirs, dispersions. owing to the fact that it is rigidly converted with its den. of Pulga. Cal

### MASSAGE APPARATUS.

A patent has recently been granted upon a device for securing a vibrator to the hand for application in the operation of massage. The apparatus may be adjustable to adapt it for use by different persons and adjustable to adaly it for use by different persons and may be severy (chapped to the hand, so as to impart to if the vibratory movement that is used in certain massage retailments. As shown more particularly in Fig. 2 which is a cross section of the device with the vibrator removed it comprises a padded unbino A provided with two plates B and C which terminate in horns E and F that fit the palm of the hand These horns may be covered with sleeves K of rubber if desired The plate C is formed with two lugs, between which is mounted a screw of and the latter is provided with a knurled thumbplece, whereby it may be



TABLET ATPARAGE

### Scientific American

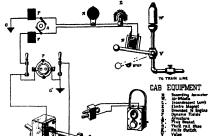
turned The plate B is fitted with a nut H that on gages the screw, and as the screw is turned the plates are relatively adjusted to bring the horns closer or are relatively adjusted to bring the horns closer or move them farther apart in this way the device may be clamped on the hand. The cushlen A, how-wer, renders the device combratels to the operator Projecting from the forward end of the device is a bracket. As a indicated in Fig. 3.1 to which the vibrator mechanism is applied Fig. 1 shows the preferred form of vibrator, which has a threaded storn that congame a in the bracket / A locknut / serves to make sochet in the bracket J. A lockmut J serves to make the vitractor is assessment of the vitractor is assessment occupied with a hundle sat indicated by deticed lines to that it may be used without attacking it to the hand in such a case however various "applicators" are secured to the threshed stem to take the place of the operators hand Fig. 3 shows another form of the contract o

STREET INDICATOR FOR CARS.
The desirability of having the streets abnounced by means of a conspicuous sign in a street car has often been urged but hitherto efforts in this direction have been urged but hitherto efforts in this direction have met with little success Quite recently when a device of this type was about to be adopted on an importan-city line the objection was raised that it would ob-struct and detract from advertisements placed in the This objection is overcome in the apparatus shown in the accompanying engravings, which not shown in the accompanying engravings, which not only announces the atreets but also displays adver-tisements at the same time. The inventor hopes that itsements at the same time. The inventor nopes that by making the device self-paying as well as a convenience to the public, it will meet with better favor than street indications heretofron devised. The prominence of an advertisement placed where all eyes would be concentrated upon it should make this a most valuable advertising medium. It is the in most valuable advertising medium. It is the in ventors idea to use a succession of advertisements so that the display could be changed at out a street with the street number. The sign display and street ator is arranged to be hung at any suitable point

The railroads have long recognized the fact that what is needed is not a machine to take the place of the outginer, but one which will sat as a check upon the engineer without taking the responsibility from his shoulder—a system that will perform the engineers work in case of any longe on but cars.

lapse on his part this lapse so that the responsibility for fail ure on the part of the engineer will be de-terted A system of this sort was recent ly installed for pur poses of experiment over a short stretch of the Eric Railroad from Newark to South Pater son. The system is quite ingenious in the tion against broken rails as well as colli sion, and furthermore is provided with tele enables the engineer to communicate with sta tion houses along the line when the train is brought to a stop for any reason and even while the train is run ning at full speed. The advantages of this tele

anyantages of this tele
phone system will be appreciated by passengers who
can use it to communicate with their homes or to
conduct business while or route and the train dis
patcher is enabled to rous into direct touch with the various units along the line which units along the line which are under his in this system the track is divided into block sections, and the train as it enters each block else trically tests the block shead to determine whether



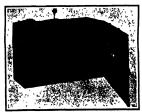
metal frame of the locomotive.

metal frame of the locomotive. Enough the statement of the cutto interrupted the magnet R would be discussed, permitting the valve F to open, thus putting on the brakes and blowing the whistle W with abortom the train line At the same time the lamp L

Fig 1 -- DIAGRAM OF ELECTRICAL APPARATUS AND CONFECTIONS OF THE CAR OF THE LOCOMOTIVE

would be extinguished and the ammeter would record would be extinguished and the ammeter would record the time when the interruption or urred. The field circuit is grounded in the locomotive at G and O'; Setween the fields and the pround O' is a kind switch A mounted on a third rail show S At the side of each block extending for a distance say of fifty feel in a rail T (Fig. 2). When the show F suggester this rail is the side of the side of the side of the side of the circuit of the fields through the locomotity. However, circuit of the fields through the locomotive. However, the circuit of the fields would not open unless there should happen to be a broken rail or a train in the

Alongside the track are two lines, U and D, one of which is connected at intervals with the rails of the track while the other is connected with the third rail sections T These lines C and D run to a station house where the circuit is completed through a switch house where the tireuit is completed through a switch that may be opened by the engineer in charge of the house whenever he desires to stop the trains along the system under his control. The line  $\mathcal O$  contains a switch a for each block section, which is held in closed position against the tension of a spring by means of an electro-magnet  $R^*$ . The latter is connected in series electro-magnet  $R^1$ . The latter is connected in sortes with the rails of the track and is energized by a bat tery B at the opposite end of the block system. In case of a breakage in one of the rails, or should a switch be thrown open, the magnet R' would be de-energized. permitting the switch a to open and thereby break the field circuit of the dynamo on the approaching the field circuit of the dynamo on the approaching trials with the consequent setting of the brakes as described above. The same result would follow if the circuit through the magnet k should be short-circuited by a train on the block. At P. (Fig. 1) is a plug socked adapted to revelve the telephone plug coanse-tion. The telephone circuit is completed past the well-clear at through a coil R. This resistance permits switches a through a coll N - this resistance permits the passage of the alternating current of the magneto and telephone, but prevents the passage of the direct current to the dynamo so that telephonic communication is not interrupted by the block system.



STREET INDICATOR FOR CARS.

in the car and immediately after passing a street the mechanism is actuated to announce the next street and display a fresh advertisement. This change is effected by means of contact plates which are secured effected by means of contact parces which are secured to the cross where supporting the trolloy wire. The contact plate ongages a spoke of a wheel, causing the latter to make a quarter turn and momentarily close an electric circuit coming from the wire that supplies current to light the car. This momentary impulse sciustes a relay in the apparatus contained within came of the indicator, and by means of a small electric motor the webs on which the street numbers and signs are printed are turned to the required degree signs are printed are turned to the required degree Should one of the plates become deached from the cross wire the conductor can operate the indirector yu usans of a switch. When the end of the line is reached the michanism is reversed so that the street will be announced consecutively in the reverse direc-tion Bhould the air cross a different set of streets on the return trip, instead of rausing the web forward on the return irly, instead of running the web forward for the whole round and then rewinding at the start-ing point the web may be arranged to bear the streets of the return trip interspersed with the streets of the forward trip and a shutter may be employed to cover the street names of the first part of the trip, exposing only those of the return trip. The inventor of this ctreet indicator is Mr. H. Alwies, 214 South 11th

#### AN AUTOMATIC RAILWAY SAFETY SYSTEM.

It is a comparatively simple matter to develop an absolutely automatic ruliroad system in which the engineer will be entirely dispensed with and the trains will run under electrical control from some central controlling station. The reason this has not been done so far, however is because no entirely automatic engine ig as safe as one controlled by an engineer



there is any obstruction on the rails or whether the

talls are broken The accompanying disgrams illustrate the equip-

The accompanying diagrams illustrate the equip-ment used On the locomotive there is a shut wound dyname driven by a small steam turbine which is supplied with steam from the boller in series with the armuture 4 of this dyname is an incandescent the armature 1 of this dynamo is an incanoscent lamp L a recording sinusetr R, and an electro-magnet E which serves normally to hold the arm of valve 1 on the afrbrake pipe of the train The fields F of the dynamo have their circuit completed through the

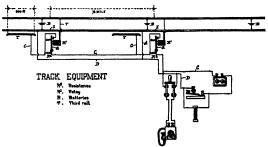


Fig. 8 -THE TRACE SAFETY AND TELEPHORE CONCUES.

### BRITAL STREETED INVESTMENT

Biostrianal Develope.

BWITCH-FALOU-P. C. Brivas, Little Rock, Ark. In this Improved countraction, the in reutine parameterly connects the cord to the plate, so that the cord extends from the plate and the plate of the plate from can position to the other, does not cause binding of the cord at its point of connection with the plate.

GRADER — J W HEALTH MODEL OF THE MET AND A CHARLES AND A C

#### Of Comerci Interest.

Of General Interest.

WALL-MOID—E. W. Cotales, Fort Dodge.
Iowa. This invention pertains to creme to
concrete walls, and its object its to provide a
new and improved wail mode for use in build
ing a monitible concrete wall, with or without
air spaces and with a facing of a different,
there material to enhance the appearance of
the wall.

and a manuscritic concrete wate, with or without there materials to enhance the appearance of the west.

Alterial collection of the control water water for the control water water for the control wa

tudinally of the arrent py across on the war-wheels.

BEER TAPPER — W W Painstolar Lead-ville, 'col The larcetion relates to that type of tapper in which the valve is fitted in the bushing of the bung hole and the picturies as provided a novel arrangement of valve cosing as securing director and estimate the section of the tapper in controlling the fluid to be demonstrated.

dearm
DRINK-SHAKER. — J Hauratens, New
York, N Y The invention relates to drink
mixers, and its object is to provide a shaker,
sore expecting feedings for use in saking
contraints, mill proteins and the drinks. As a
related to the contraint integrate occing of the hyrothesis and exhaling and posings of the drink into a glass.

mill and a grinder, in that it is adapted to hammer the ere so as to break it into small pless and then grind and crush it into smaller particles.

under strain.

TANK HEATER — W THEER, Androom, N D The aim of this investor is to provide a means for heating the water in a tank or reservoir, the heater to be partially submerped in the water and having means for supplied freel, and for permitting the results yearing and the submace of sufficient air to properly contains the few submaces of sufficient air to properly contains the few submaces of sufficient air to properly contains the few submaces are sufficient air to properly contains the few submaces.

des by wb

the motor

GABRAGHCAN — W B. Osmouz, Clarks-burg, W Va. The main purpose of the lover tion is to provide a garbage can which has a hinged cover pivoted in such a manner that it may be raked by foot pressure, thereby pe-sitting the use of both hands in transmitting the garbage into or removing the garbage from



Kindly write queries on e-parate shoets when writing about other matters, such as patents, subscriptions sooks, etc. This will facilitate answering your ques-less. He says and give full name and address on ever-

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#### NRW BOOKS, RTC.

THE GAS TURBIES. Progress in the Design and Construction of Turbines Operated by Gasses of Combuston by Henry Harrison Supice, B Sc Phila delphia J B Lippincott Company Pp 362 Amply Hustrated

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ognesi. Ours is the Oldout agency for su IN & CO., 361 Breadway, New York, reach Otice. 625 F St., Washington, B. C.

#### INDEX OF INVENTIONS

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## WE MELLINS CIT OF PETAL

(One-cheef from page 251.)

sobples of the land. These "high phoos" were the subjects of many warn ings to the children of izenel. There are other high places in the vicinity of

Still another interesting rain is of the Billi another interesting rain is of the oscialide Mil-Dier (the convent), and is resident by an hours hard climbing along raviuses and un rech-lever saintrease, to raviuse and un rech-lever saintrease, to ing the striking Youb of the Lione, we reach at last the high pintens on which stands Mi-Dier It is nearly 100 frest long and almost as high, being similar to the Khannesh, having its decolle rows of six columns each, but witnesd by cor of six columns each, but widened by cor-ner-plantars on both sides and on both stories. On this plateau there are several places of ascrifice and a fine view of Mount Hor to the southwest. The early history of Fetra is hidden in the mists of remots antiquity. It was probably the capital of Edom its first

mention is in sacred history in II Kings 14 7, which records its conquest by Ama-siah in the ninth century B C From sish in the minth century B C From is, 16 1, we bear that it was then, about 700 B C, held by Monb It is evidently referred to in several prophetic desnucia tions whose fulfilment has been most literal About 300 B C it had come into possession of the warlike Nabstassas descendants of Nebaloth the eldest son of Ishmael, who made it their capital and it was known to the Greeks as Petra Strabo the Greek traveler and historian describes it at the end of the last century B C, as also did Pliny the Roman writer in the first century of our era In A D 60 Arctas IV King of Petra had extended his conquests to Damascus and is referred to by St Paul in II Cor 11 32 In 105 A D, in the reign of Traign, it passed under Roman rule Ecclesiastical historians in about the fourth century mention it as a Christian metropolis It continued populous and prosperous as a trade depot until about the beginning of the fourth century when the caravan routes from the north which the canwan routes from the north which had for so many centuries led post its arched portal to the Red See were diverted to the Persian Guil. After this it rapidly declined and it is not heard or again until about A D 536 Even its very existence and atte were forgotten until it was visited and identified by Seet sen in 1807, and explored and described by Berchard in 1813 the later gaining secons to it as had did to Recent in the disquise of a Medium piperim to the disquise of a Medium piperim

Treasure Hunting.

(Continued from page 222)
a noted Lake diver, devised a diving suit strengthened with metal rings to support the rubber against the enormous water pressure In this suit Pelky made a successful exploration of the ship but on his second descent his suit collapsed and

he was hauled up dead Even this fatal accident did not deter weekers from planning further attempts on the immense cargo of copper at the bottom of the lake A famous diver of Duluth, Minn, M F Chalk by name, was invited to go down, and to tempt him to make the venture \$2,500 were offered him make the venture \$1,500 were offered him before be went fown and a written promise that he would get one-half the net returns from the wreck in addition to this his life was to be insured for \$20,000 for the benealt of his family. But after making an examination of the loss-tion and the depth of the water, (Malki returned this factoring offer. Blagus secondard of great depths to which divise have deconsided to impost wrecks and help to recover tresumes must be and help to recover tresumes must be leadane, John Hagperty, who went didn's to impost the steamable, "Ovegon." wheeled off Fire Iddand, was generally expected to their reached & glothy of "Item."

withclood off Fire Island, was generally reported to have reached a depth of 150 flyst. But to disprove this the hydro-generals charts show that the depth of region where the potenties such was only byl dept. Other constraints diving finits med on page 200.)

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(Continued from page 227) must also be accepted with a slight allow ance for exaggeration

In recent years deep-water salvage of treasure ships has excited the cupidity of divers adventurers, and business men There is altogether too much wealth lost under the water to suit us. Here is what an expert diver and wrecker has to my

Within fifty miles of Sandy Hook there is wealth enough sunk in the ocean sand to stock the United States Treas ury All the private treasure ever buried in the earth would be a triffe by the side of it. The bottoms of both the Atlantic, and Pacific Oceans are vast treasure beds. The man who can devise a means of The man who can devise a means or traversing the ocean bottom might rival Rockefeller A vast amount of treasure is as accurately located as the banks of Wall Street. Any experienced diver can take you to a chart and lay his fingers on any one of twenty spots and say Go to longitude so-and-so in a latitude defin able within fifty feet, dive deep and bring up a fortune (mly you can't dive deep enough A great deal of this treasure is the deposit of recent years. Still more went down before the days of occan thers At one time specie was trans-ported in men-of war Gold dust and dia monds were shipped from mines on rickety schooners for want of better

in twelty years there were mearly five thousand wereks on the Great Lakes. Of these over one-fifth or approximately one thousand, were total hosses. The total measurement of the continuous of in twenty years there were nearly five covered The steamer "William Home," which sunk in 1895 off Swishwah Point, which sunh in 1895 off Swishwah Point, Lake Michigan, carried to the bottom \$230,000 worth of steel billets, and the steamer "Clarino" loat in 1816 between Cleveland and Detroit, carried a deck index of new locomodives to the bottom. Iron and coal cargoes have been distributed freely over the bottom of the Great Lakes and some day the miners of these core equipped with improved diving dress, may recover goodstood fortunes from the bottom of the lakes.

scene of treasure hunting, and it is com monly spoken of in the lumber camps as 'The lake of Sunken Treasures' The reason for this is that back in the early reason for this is that back in the early lumbering days large aums of money were shipped to the numerous lumber camps in small vessels, and literally dos ens of these were lost. All of this money lies somewhere at the bottom of the lake for the treasure hunter to find

Among the many important wrecks of

Among the many important wrocks of treasure ships which are partially or exactly located on the charts of the gov ernment, mention should be made of the Pacifix Mall stoamship 'Golden Gate,' sunk neur Manzanilla, Mexico with \$800,000 in gold coin and buillon and the Klondike steamer 'slander,' sunk or Douglas Island, Alexka with \$750,000 in gold dust. The greatest prize of all sunken treasures.—if all is true which arrying to the bottom of Cumana Bay. tral American" went down of Havana with a similar amount in gold. The steamship "Lexington" which went down in Long Island Sound was reported to have contained \$300 000 in specie

The record of these number treas (Concluded on page 229)

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ships along our two coasts and Great Lakes could be extended indefinitely Lakes could be extanded indefinitely Some of the treasure has been recovered such as the boxes of gold lost in the Bpanish steambhip feterodes sunk man the Canary Islands, but in most cases very little if any of the money has were been brought up by divers There have been strunuous efforts made to salvane these tween weath and the salvane these tween weath and the salvane these tween weath and the salvane these tween weath and the

to salvage these known wreeks and in ventors have been busy for half a cen-tury devising means of getting at the tury devising means of getting at the wealth lost under the water. The all minimal diving suit that resembles an infinity of the suit of t of this armored diving dress was so grea-that ball bearings of harder material than aluminium were found necessary. The aluminium auth protects the diver from the water pressure and at great depths water pressure and at great depths that a the water pressure and at great dopths the armor is so light in wright that a man can walk around easily with it on man can wank around easily with it on in addition to the articulated armor suit the diver is provided with an in ricate system of hooks operated by the hands from the inside so that his work can from the inside so that his work car be perform I without exposing any part of the body. The divor is provided ith a felephone a headlight and an appar-atus which registers the amount of air atus which registers the amount of air sent down tirough the breathing t be The wreciers from above can thus tell at all times the condition of the div r

The science of salvage as conducted by modern wrecking companies in the ra moorn weeking companies in the rais ing of ships in a matter totally outside of that of raising suchain treasures. The control of the raise them to the raise them for the most part been in the water so long that to raise them by compressed alr would be impossible. Teler rotten decks and timbers would explode and burst assunder long before soldient air could be pumped into them traise it em from their modify beds Consequently the savings of treasure-laden ships of the part is purply a matter of deep-sea diving. The diver who was go down it december the work of the venture and the part of ing of ships is a matter totally o staids

ing device the man who descends to great depths must encounter other perils of a blood curdling nature Rotting decks and timbers may set a trap for him through which be may fall to his death Long tunnels through deserted cabins and hulls filled with floating objects may and nulls hird with notating objects may tangle up his tube through which fresh air reaches him and within a space of a few minutes death by suffocation fol-lows. There are grisly welves of the ocean to encounter in some seas veritable ocean to encounter in some seas veritable man eating sharks and other death-deating monsters of the deep A single raise step may precipitate death and yet time is precious and speed of action must be attained Dark ionesome hulls must be examined intricate cabine broken into and not infrequently the golden treasures. and not infrequently the golden treasures must be dag out of the sand and mid into which they have buried themselves and one that it is a grewsome sepreince and one that keeps the trongered which can extend the interior of a sunker skip whose ribe have been rotting be mach the occas a waves for a century or more. Some timbers are so well preserved that they rannot be broken easily with an ax and others so decayed that are sandy as a further source of the control of t a every can tarter a nam through theses.

The diver earns all the wealth that he gots from a sunken treasure ship and only the hardest and must expert divers will undertake this work. They prefer as a rule to stick to ordinary wre in water forty to fifty feet deep.

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## Scientific American

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### A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CH. -No. 14. | NEW YORK, MARCH 19 1910 | 10 CENTS & COPY | 63 00 4 VERR



This view is taken at the bew looking aft. It shows eight 12-inch and four 47 inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead. This is the first ship to carry twelve 12-inch guns trained directly ahead.

#### SCIENTIFIC AMERICAN

#### ESTABLISHED 1843

MUNN & CO , Inc., Editors and Proprietors

#### Published Weekly at No 361 Broadway, New York

CHARLES ASSESSMENT FOR PART AND ASSESSMENT A

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MENN A CO. Inc. 55 Broadway, New York

NEW YORK NATURDAY, MARCH 1916, 1910

The Shirot a shwaye, had to revive for a naturation illustrated arrive and without a first point of the photographs are about 16 united about and the facts authorable the contributions will receive appearance of the particular Acceptable arrive will be paid for all results apare rates.

#### A TRIUMPH OF MODERN STEAM ENGINEERING

MOM the many brilliant sucreases of the scale of the scale which have been obtained at the Fifty ninth have been obtained at the Fifty ninth heavy service of the New York Subway libri by the heavy service of the New York Subway libri by the low pressure sylinder rahmant and the nonleaser not only has the nouted of the present reciprosating an only has the nouted of the present reciprosating as a increase of nearly 150 per cut in the recommite capacity of the whole plant

In a recent issue of the SLIVILIK AUPRILA WERE AND AUPRILA WERE AND AUPRILA WERE AUPRILA WAS AUPRILA WERE AUPRILA WAS AUPRILA

During 1908 it became apparent that the rapidly increasing triffic in the bibbway would render it necessary to provide additional power for the sinter of 1909 1910. The main power plant consisted of after 1500 1910 2011, and the continue and the ratio power plant consisted of after 1500 1910 2011, training units of lighting and signal purposes. Of these engines and there ratio units the authors of the pair ray. 'In general they are the most satisfactory large units ever bulk, as the years' experience with them has proved.'

In considering the problem of securing an additional supply of power electric transmission of power from a hydraulic plant was rejected because of the high cost of a double transmission line from the near est available water power and the impossibility of getting reliable service.

The gas engine, it will surprise many of our readers to learn while offering the highest thermodynamic efficiery would have cost at least 75 per cent more than an ordinary steam turbine plant and its main tenance and operation account would have been from

cenance and operation account would naview from four to ten itimes great; The alternative of building more re-iprocating englies of the tipe already installed was rejected (in spite of their mest satisfactory prformant; ) because of the high first cost and the small range of (conomical operation the tween 7 300 and 8 700 kilowattes). The water rate relaing very rapidity beyond these limits

The wait rate ening very rapion's occord to be interested as a beaver in the Installation of the by excellent and a beaver in the latest of the latest and the latest and the latest and latest a latest as a low pressure turbine with the present engine at least 8 per c. on higher efficiency sould be seened than with a high pressure turbine unit alone, and it was finally decided to place an order for one 7.00 kilowat! (maximum rating) turbine unit aluee by this mans "the companie would not only get an increase of 100 per cent in capacity of the combine engine and turbine." but at the same time after the engine and turbine." but at the same time after the engine and turbine. "Int at the same time after the engine as the latest and the latest the conditions as well as the latest and the latest and the latest and the latest the engine and turbine." but at the same time after the order to get firsts using the latest and the lates

The net results obtained with this first installs tion are summaried as follows. An intrease of 100 per cent in maximum causatily of plant, an increase of 148 per cent in economical capacity of plant, a saving of approximately 85 per cent of the condensed steam for return to the boilers, as average improvement in seconomy of 15 per cent of

the best high pressure turbine results, an average inprovement in economy of 25 per cent (between the limits of 7,000 kilowatts and 15,000 kilowatts) over the results obtained by the engine units abore, and lastly, an average unit thermal efficiency between the limits of 6,500 kilowatts and 15,700 kilowatts of 20.6 per cent

These results are surely entitled to be considered as constituting the lov pressure turbine one of the greatest triumphs of modern steam engineering

EY WEST, by AW AMERICAN GINRALTAR Y WEST, by virtue of its geographical posi-tion stands in the same strategic relation to the Gulf of Mexico and the Caribbean Sea as does Gibraltar to the Mediterranean, and its naval and military importance, which have always been recognized have been greatly increased by the results of the late Spanish war and the construction by the United States government of the Panama Canal The transformation of Key West into a great navel and military station which shall rival in importance the fortrees of Gibraliar is advocated at considerable length in an article by Commodore W H Beehler U S N, Commandant of the Seventh Naval Destrict Which appears in the March number of the Journal of the Military Service Institution The first part of the Commodore's paper is devoted to an urgent plea for the more complete co-operation of army and navy forces. The army and navy should be as intimately connected as are the navy and the marine corps, and this connection should include, as far as possible both the personnel and material. Guns and ammunition should be of the same general type. with the latter interchangeable and supplies and stores should all be of one standard. It is admitted that close relations between the army and navy would be subject to certain limitations, but the Commodore s that it is essential that the coast artillery co and the navy should be intimately associated for the officient defense of our seaboard. There should be a definitely assigned portion of the navy to act as Navycommery assigned portion or the may be at an early Coast-Defenders, and in this class should be included second class battleships or older battleships, the smaller torpedo beats scouts, submarines, mine-lay-ing vessels and tugs. "Their cooperation in the de-Coast-Defende fense of any particular naval base should be definitely arranged in time of peace and they should maneuver and drill now, under the command of a designated officer of the coast defense service, whether he be an army or a naval officer'

In his proposal to make of Key West an impregnable Olbraliar, it is pointed out that the present defenses at Fort Taylor are imadequate for the reason that lattic-ship can like at the currance buoy seven niles south of Fort Taylor, beyond the range of the 21 inch riffs mortan, and destroy Key West from that point without being exposed to any danaer the remaining velocities of projectites from the direct firing 10-inch and 12 link gons being insufficient to penrate the armor of any latticably, whereas these same cellber guns on a hatticable could shell the city of Key West and completely destroy it.

This consideration brings the Commodore to his novel proposal for rendering key West impregnable the points out that in place of high hills or a luge rock as at fibraliar, for the mounting of coast of fonse guns Key West Harbor, twenty five miles in length red on the north by a line of low reefs shoals which form a complete protection on that side, while seven miles to the south of this line there is a parallel line of eastern shoals, some of which are scracely awash at low tide and none more than eight To build forts on these outer feet above high water reefs would be so costly that it could scarcely be con-sidered, but Commodore Bechler proposes to take our monitors and older battleships which have pa them in selected positions upon these reefs, and utilise them as permanent turret forts. Thus, for instance, selecting the shoal known as Rock Key where there is a small natural harbor, he would lighten the o monitor "Amphitrite" by the removal of her propelling engines, haul her into the harbor, build are the the vessel a dyke of piling, rock, and riprap, and then fill in the space between the inner face of the dyke and the ship with material hydraulically dredged and deposited. He estimates that the work would not cost more than \$50,000, and he claims that the seacoast defenses would thus be increased by a doublecoast onemose would rung be increased by accurate the unrested fort containing four 10-inch breech-loading rifies and provided with admirable protection. The visials of the fort, that is the ammunition rooms, turret turning gear etc. would be pretected not only by the armor of the ship but also by many feet of the in losing earth and riprap. The deck of the monitor would be about eight feet above mean low water, and the riprap would be carried up the sloping face and over on board, leaving only the turrets and super

atructure exposed

The ship as thus imbedded would furnish, says the
Commodors, a complete, modern double-turreted fort,

ary feature to operate the p with every nec with quarters for the officers and mon of the garri-son, and moreover, the entire cost of the installation would be less than the cost of mailitaining such a shipin the navy for one year 'The monitors "Mantonomah," "Terror," and 'Puritan' could be installed upon the adjacent reefs, and the range of the sixteen 10-inch and 12 inch guns of these forts would com-mand a large part of the Straits of Florids, and especially that part which is used by westbound ve entering the Gulf of Mexico which navigate close to he Florida reefs to avoid the strong current of the Gulf Stream Incidentally it may be mentioned that the dyke would be extended in each case to form a small harbor of refuge for torpedo boats and sub Referring to the proposed island fortifications for the defense of the entrances of the Chesapeake it is suggested that it would be a great economy it one of our old battleships such as the "Oregon" were used as a central point about which the island could omy if be built

where it is a question of great interest and of uncertainties moment, whether this every noval preposal of the Commodore does not provide an opportunity to greatly lengthen the useful life of the batteship in view of their enormous and rapidly growing first cent the rapidly with which these instruments of war depreciate in military value is consenting aspaining in a few years after their commendation of the property of the property of the property of the commodors of their contents of the property of the

#### PAULEAN'S FLIGHT NEAR NEW YORK

VALTOR LOUIS PATULIAN succeeded last week in getting the bond which he is required to put up in case he files reduced to \$8,000 for one week, and on Friday, March 11th, he made two exhibition flights at the race made and the reduced to the result of the reduced to the result of the reduced to the reduced spectators as it was thought into M Fusilian would attend to the with his werltal radder tiled or There was an is to 10mile brees blowing, and by starting against the wind Paulhan left the ground after a run of about 76 teet. He rose rapidly, and in the course of the two circuits of the track, made in the course of the two circuits of the track, made in the course of the two circuits of the track, made in wind Despite the sharp turns the machine did not five very much in making them It appeared to rock and just in slightly, but was always under parfect control. The descent was made rapidly and at an angle of the light of the property of the track the reduced was made rapidly and at an angle of the light of the property of the reduced was made and the none circuits in 2 minutes and 38 seconds.

### REQUIREMENTS FOR THE SCIENTIFIC AMERICAN

His little annual competition for the handsome trophy given in 1897 to the Aero Club of America by the publishers of the Eccative America. As in new one to all artisters. As aviation has at last reached a stage where crosscontary fights of a considerable distance are being made, it has been decided to sward the trophy for 1816 to the valutor who makes the longert cross-country flight in cross of 10 miles, which has been fixed as the minimum distance. A round trip flight of 35 miles each way will also fulfill the conditions. The flight may be made at any point in the United States that is convenient for the strator, who must notify the Aero Club of America or the Britzerium Austura as a sufficient time in advance to allow of the sward of a repersionative of the club to officially someting of a repersionative of the club to officially observe it. The observations of the complete for the trophy whenever compation miles.

The dates of the international balloon and servipilno races for the Bennett trophies have been fixed by the Aero Cibb of America. The balloon roos will be held at BL Louis on October 17th, and the screptime rare above the Hempstand, L. I. plains (probably) on Crober 28th All Plans are also on foot to held big wrintion meets at San gatonio, Texas, in April, et &besisted City, N. J. D. July, and a St. Louis in Quick.

### Scientific American

#### ENGINEÈRING.

The Utilish Rates army has recently adopted a new type of mechan gue withe can be carried by one man, while we send gue with a full equipment of stands and ammunition can be peached upon a mule. The new weapon can be fired from the shoulder. The barries are carried in duplicate, and can be rapidly changed when they become basted from continuous

ha a resent communication to Fight on the relative military value of acceptance and airship, 6.0 Capper of the British army believes that the improved servplane will have the dirighte at its mercy. He predicts that the future acropiane will be able to accend to heights of 10,000 feet and over, from which it will swoop down and destroy the more slowly moving dirichine heights.

The New Mayes Railroad has proposed to the tity of boston to state into the joint construction of a tupnel between the borth and South stations in that city They offer to speed \$18,000.000 on the control to the tunnel which is to be electrically operated, provided the city will bear the expense of \$10,000,000, which it is settimated will be the cest of the purchase of the necessary land.

One of the most remarkable features of the New York Public Library, now slowly nearing completion, will be the lunge stank room, bo feet wide, also fact long and 80 feet in height, containing seven tiers of stacks. The metal work of the stacks alone weight about 3,000 tons, and revently, in estimating for the publishing contract it was fround that uper-ly to pass once through the multitudinous nests of stacks it would be necessary to cores seven miles of distance:

The last annual report on the shooting in the birt is har wy show that the percentage of this to rounds fixed during 1900 was 6407. In 1905, it was 2007, in 1906, 1460, in 1907 1543, and in 1906, 545, 075 to significants of these figures will be evident when it is stated that in 1907 the site of the target was greatly reduced, the number of bits in that year being consently only sithethy greater than in the year prequently only sithethy greater than in the year pre-

placing of a large order by the Admirally for liquid in a last of the cangerwise statements in the liquid in the lost of cangerwise statements in the contemplates the practically extinct to the of ull fuel There is no truth whatever in this statement. A rebundered tone of ull will be started in future battleablys as an auxiliary to eval and oil will continue to be used as foul in certain tunesee of torpedo busts Graut Urtilain possesses no such extensive oil fields as would warrant as drastic change of this character.

A passeal scheme for constructing a north break water to the entrance of the Pananau Canni has water to the entrance of the Pananau Canni has papproved, and the preparatory work is being done paperoved, and the preparatory work is being done at Culon, and will sheller vessels which are making that at Culon, and will sheller vessels which are making the north-carrier within prevail from Culore to January There will be two jettles of rock, which will call the prevail from Toro and Manasatillo points until they reach deeths of water of 48 and 44 for, respectively

Some hydridicions statements were made recently Representative Rainey about the new 1 (in hir coast defense gun, which is undergoing test at Sandy Hook, in the course of which he spoke of the gun as having 'burst' on trial. As a matter of fact, the gun has shown excellent results, and given much satisfaction to the army men. The serident, which was a trivial one, consisted in the breaking of a part of the mechanism of the disappearing carriage, whith deaped the test only a few days, and was quickly under the property of the property of

It is now officially stated by the Pennsylvania Raliroud Company that the four tubes under the Rali-Rilver and the electric service as far as Januace will be pinced in operation on May 15th. The trains will run, under a five-minute headway, from the new terminal at Thity-bried firect to Januace without a stop, in 18 minutes. The main yard, station, and office-000 will he expanded for this purpose. The tunnels to New Jersey will be in operation by July 1st, and the lines along the north shore to Great Neck carly in January, 1911.

January, 1911. Exploses the Mark A. C. Swinton described, a special stansproposited surcolause built by Explose of turbine fame, which made successful slightly in 1898, thus antestating the Langles in classes, which problem of diameter, mispilled steam to a cylinder 134, by 2 inches in classes, which weight of engine, propoller, and water being 134, pounds. The servojame consisted of two vings and a tail built of a silicovered, cane framework, the whole apparatus with engine weighing 35, pounds. The model made several fighting 35, pounds. The model made several fight of about 100 yards distance, coming down when the steam pressure was exhausted. The bodier, which carried 50 pounds, was heated by a spirit lamp.

#### ELECTRICITY

In an article in La Revue Meetrique, on the effect of high temperature on insulating materials used in dynamo-electric machiners; it was pointed out that cotton does not show any injury when exposed to temperatures below 105 day C, but that at 115 day C It begins to deteriorate and above 125 degrees it rapidly distinguishes.

The reputation for efficiency of the New York tolephone service has a great all over the world. In Paris the service has been so peor of late that the subscriber have organized to demand improvements. Quite recently the Ministère de Postre et des Tri. graphes of Panne applied to the vier-presiden, of the New York Telephone Company, asking if he would be villing to train at telephone officials from paris in the various methods employed in New York. The connect was called accelerate.

The state of the s

A recont number of the Filestric Italiaway Journal describes briefly a peculiar electric locumotive used for canal havings near livemen. The locumotive runs on a quay, which has to be kept clear for the passage of drays. In order to secure the requisite weight for adhesion, the lomounture is built in the form of two inverted Us connected at the top with a girder. The which of each lines in only 3 that here and so the drawing motor had to be placed in the upper part of the and can travel up and down the quay without the turbing the trucks, which pass between the Us and under the connecting girder.

A special type of motor has been built for a British proder factor; in which pres autons have been taken to render the motor flame-proof and explosion proof. The motor case is very strongly built, so that it will stand explosion of dust or gases which might find thair way into it. The Joints of the motor case are packed with hence rose disposed in fact this being concern to the proof of the motor case are packed with the proof of the motor to the work of the proof of the motor. The beautina are asked specially scaked to prevent the creape of hot gas in case of explosion within motor. No ventilation for the interior of the motor is provided, but the casing is formed with corrugations with furnish a large cooling surface.

In the discussion which followed the reading of a paper on underground conduit construction for large transmission systems before the American Institute of Kiestrical Ampiners in this age to tendos ting litus ration, was given to posit out the advantages of concerts over the beause of its lower thermal conductivity and its better host resistance. A hurrout control of the beause of its lower thermal conductivity and its better host resistance. A hurrout intity and its better host resistance. A hurrout intity of the control of

The naval gun factory at Washington, D. C. is equipped with six crames four 160 not relate on the first track, a 110-ton trame on the nast track above and a 20-ton crame on the third track which is 160 feet above the ground floor. The track is 160 feet loss, or the ground floor. The track is 160 feet loss in the ground floor. The track is 160 feet loss in the ground floor. The track is 160 feet loss in the ground floor. The track is 160 feet loss in the ground floor of the ground floor in the ground floor of the ground floor and ground floor and the ground floor of the ground flo

The very first day of the inauguration of letter telegrams proved the surveys of this method of communication and gave promise of a great choice of communication and gave promise of a great choice principal neutron of the communication of t

#### SCIENCE

On March 6th Vesuvius suddenly became active again There was a continuous cruption for twenty four hours of red bot stones and ashes, accumpanied by internal detonations Several fissures opened, from which gas and laws emerged in great quantities

Prof. Wilhalm Trabert has been appointed director of the Central Institute for Motorology and Geodynam ice at Vienna, succeeding the late Prof Josef Maria Pernter As director of this institution he is the official head of meteorology in Austria

Dr. Falix Exact of Vienna has completed the great treatise on meteorological optics begun by the late Prof J M Perater in 1802, about two-thrids of which had been published up to the time of Peraters death in 1808. It is the only extensive modern work on this subject

The commission appointed to examine the Leaning Town of Plan has provide that It thinks its found tions may need attempth along A spring relies under the tower, the water of which is raised by steam pumps for the use of a local factory A at he bed of the spring is empited, it is feared, a subsidence of the ground on which the campanile stands will follow

Dr. Herman O. Bunpus, director of the American Massoum of Natural Bistory announces that up to leak August, at least, V. Siefmanns and R. M. Anderson, August, at least, V. Siefmanns and R. M. Anderson, from Mr. Riefmannoun, from Herschelt Island. In the Artic Grean dated August. 19th 1900 has been received telling of the adventures and successes of the parts.

The task which the American south polar expedition had set therefore perform in the opinion of RI grant and a state of the opinion of RI grant and the opinion opinion disaments as no one had ever landed in place where the exploring party purposed to land in place where the exploring party purposed to land in the opinion opinion

Dr. Le Faguays recommends a process of distinction which consists in lowlwing upon the contaminated surfaces a current of air hosted to a very high tempers ture (400 to 300 day F). This process may be applied not only within buildings, but also to be surreare of attents, paris, set: The superstate is beated race of attents, paris, set: The superstate is beated only destroys disease germs but it is very efficacious against fieus and other vermin.

Enhance has devised a process for the manufacture of sulphurie acid based upon the sumployment of the virviolet rays emitted by mercury vapor lamps. A mix tare of air and sulphurous acid gas is introduced into a tower, lined with lead, into which water is injected in fine jeis. Under the influence of the ultra-violet radiation of lamps in the tower, the sulphurous acid is entirely converted into sulphurie acid. Several coler are connected together. The stronger of the sail pulsar acid solution obtained in the first tower can be increased by sprarjor it instead or sairer, into the outlooked and the sail of the sail of the sail of the outlooked and the sail of the sail of the sail of the outlooked and the sail of the sail of the sail of the last tower however pure water is again used as soon a say sulphurous acid appears in the excepting gases

The Euppelin North Polar Exploration Committee on recently under the Presidency of Prince Head recently under the Presidency of Prince Head and Prof. Let and Service and Service of Prince Head Service and the Committee discussed the programme for the number's sork which will be devoted to a preliminary expedition for the pur pose of studying its conditions. The government will be acked for the use of the superiors were "Proceedings for about two mouths." The superiors were "Proceedings for about two mouths. The superiors were and three will transfer to the Postdom. A correction testing the superiors will be a superior of foreign as we are a superior with the purpose of foreign as we are superiors. The purpose of foreign are superiors and the condition of the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as we are the purposed to the purpose of foreign as the purpose of forei

For one the heterologists and hypinists, who until sussess of delight in alterning third folk an nounce a discovery which will reassure these persons have are affectly one at the control of the sussessing the sussess

MEW ARROPLANTS AT HOME AND ABROAD
THE TRADUCK NO. 3" ARRIVLANE.
A noteworthy acroplane so far as actual flying is
one-grand in the "Baddock No. 2 of Messre McCurdy and Baldwin, who are still working with Dr Bell nes Baddeck, Nova Scotia. As our photographs show, this biplane is an excellent flyer. It has made a consider able number of more or less lengthy flights above the ice of Lake Bras d'Or, in a number of which passengera were taken

The planes of the McCurdy and Baldwin machine

are 40 feet long by 7 feet wide at the middle, de-creasing to 5 feet at the ends 'the wing tips which are double and at tached at ach end of the main planes, are about 5 by 5 feet in size. They frost edges, and rocked is the usual manner by means of a fork fitting around the aviator's shoulders. The horizontal product opening of the state of the tal rudder consists of two superposed surfaces spaced 30 inches apart, and mounted 15 feet in front of the front edge the of the main surfaces. The surfaces of this rudder are 12 feet by 28 inches in size A biplane tail is also used, the planes being the san

as those which form the

as those which form the This best sepane assessor front rudder. This tail is mounted it feet from the rear edge of the main planes. The horizontal and vertical rudders are oper ated by a wheel in the same way as on the Curtiss biplane In other words, a push forward or a pull backward on the wheel directs the machine downward or upward Turning the wheel to the right or left steers the machine sideways.

The motive power of this biplane is a 6-cylinder Kirkham automobile motor of 40 horse-power It is water cooled and develops its rated power at 1,400 R.P.M., at 2,000 R.P.M. it develops 48 horse-power

The radiator is novel, consisting of thirty flattened tubes 7½ feet long by 3 inches wide by 3/32 inch thick. These tubes are curved from front to rear in the same manner as the main planes, and sufficient lift is obtained to support the weight of the radiator and water carried The motor is geared to a single foot shuch propeller having a 6 foot pitch, by means of a chain, the ratio being 3 to 6. The thrust obtained is nufficient to drive the machine at a speed of over



The Herring Biplane, showing novel stabilizing fins. such as foot operation of the horizon a skill instead of whosis, etc.

win a biplane are the use of a comparatively heavy 6-ylinder automobile motor and the fitting to machine of a biplane tail of the same shape and size as the horizontal rudder. The 8-cylinder motor has been found superior to the 4-cylinder for automobile work, but this is the first aeroplane, so far as we know, to be fitted with this type of motor The motor anow, to us attend with this type of motor. The motor is placed low down upon the lower plane in order to keep the center of gravity low while the propeller is mounted higher up, so that the center of thrust shall be as near as possible to the center of resistance

of the aeroplane. The usual three-wheel chains, first used by the Aerial Experiment Association, of which Mesers. McCurdy and Baldwin were members, is fitted

After making numerous satisfactory flights above the frozen surface of the lake, Means. Baldwin and McCurdy were visited on the 9th instant by Major Munsell of Ottawa, who represented the military de-Munsell of Ottawa, who represented the mintary or-partment of Canada. The two inventors made five exhibition flights for this officer, and finally be con-sented to make a flight as passenger with Mr Mc Curdy A very satisfac-

Curdy A very maisma-tory flight of several min-utes' duration was made. Mesers. McCurdy and Baldwin made a number of flights last summer and fall in Canada, and the Canadian government is very much interested in their machine, and will doubtless eventually purchase one for military use The noteworthy point about this machine is that its makers have built it sufficiently large to carry a weighty and relittle doubt that the maing extended flights with-out difficulty

THE NEW HERRING RIPLAND

The boat constructed accordance archibition at accordance on exhibition at the Boaton show, as noted in previous issues of this journal, was the new biplane of A. M Herring The photograph of this machine, reproduced above, was taken at the time of the trial flight on March Lis, and it gives a very good idea of the biplane's novel features. The spread of the planes is about 28 feet, and the foreft width about 4 feet, the total supporting surface being 220 square feet. A 25-horse-power Curtim motor Delig 220 square reel. A 20-norse-power Curtiss motor is mounted upon the lower plane at the rear, and car-ries upon its crankshaft a 4 bladed 6-foot propeller of 5-foot pitch, designed by Mr Herring. The total (Continued on page 246.)

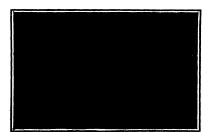


Capt. Baldwin's novel biplane. The radder above the upper plane is worked by a fork fitting about the aviator's aboutders. It corrects the skin-tipping of the scroplans,



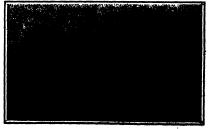
Hessra. McCurdy and Baldwin flying in their " Baddock No. 2" biplane.

This is the first aeroplane to be equipped with a six-cylinder automobile motor. It has made many as fileths in Canada.



Sir Ricam Maxim standing behind his new hinland.

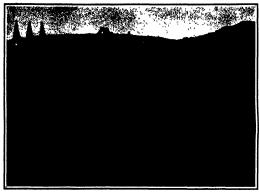
no built nearly 20 years aro.



Rear view of Sieriot XI, in monoplane, showing the new tall. Note the complete covering of the body, and the large horizontal resider at the mor end of the tell,

## BUILDING THE CLIVE REIDGE DAM FOR THE CATHELL WATER SUP-

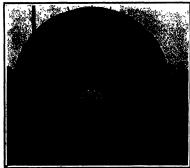
Work on the Catakill Work on the Catakili water supply, which will provide New York with five hundred million gallons of water daily, is making steady progress, as will be evident from the illustrations of this work which are horswith work which are herewith presented Briefly stated, the scheme constats of the construction of a large reservoir in the Esopus watershed in the Catakills, watersness in the Catasias, with a storage capacity of 127 billion gallons and an aqueduct 92½ miles in length for conveying the water to the New York city line The Ashokan reservoir, as it is called, will supply the city with 250 million gallons daily in addition to the 375 million addition to the 375 mili-ion gallons now available in the reservoirs of the Croton watershed. As the future needs of the city demand it, reservoirs will



Present condition of Olive Bridge dam as viewed from north bank.

be built in the Rondout and Schoharie watersheds adjoining the Esopus Val ley and from these three dams it will be possible to draw sufficient wa ter for the full capacity of 500 million gallons daily of the new aqueduct. The latter passes through the Croton watershed and in two years time, and be-fore the full completion of

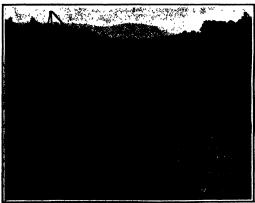
two years time, and be-fore the full completion of the Ashokan reservoir, as stored thereig will be available for delivery through the new aqueduct to the new Croton dam. The work is to be com-pleted by February, (vi) may be the work of the two the com-which will create the Ashokan reservoir, is a huge structure with a maximum height from the lowest foundation of 240 feet and a width along feet and a width along the complete of the com-pleted by the com-pleted the com-dition of the com-pleted for the com-leted for the com-leted for the com-pleted for the com-pleted for the com-pleted for the com-pleted for the com-leted for the com-pleted for the com-pleted for the com-pleted for the com-pleted for the com-leted for the com-leted for the com-pleted for the com-pleted for the com-leted for the com-tend for the com-pleted for the com-leted for the com-tend for the

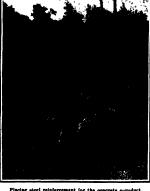




A completed section of the 924-mile steel-and-concrete aqueduct

Upstream side of Olive Bridge dam, diversion tunnel for energing river during construction





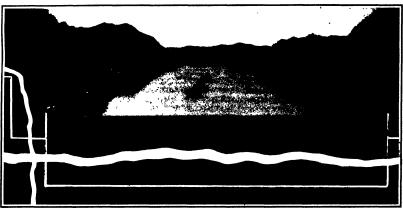
litte of dam, showing the 8-feet pipes for passing river through the work.

Placing steel reinforcement for the concrete squeduct,

feel in siddly. The rest of the dam consists of a central manager one wall and actefully shid and related to the siddle of the siddle of the control of siddle of the central of siddle of the siddle of the control of siddle of the order of siddle of the control of the control of the siddle of the control of the control of the control of the and the latter for \$2.00 feel in addition to the works that the a wast, with time feet in bottle and addition the control of the close the valley depressions and raise the water to the defired height measure the and one half inflex to suggregate beautiful. had been reached, a large culvert, 35 feet wide by 45 feet high, of sufficient late to take error of any possible modes coming down toe valley, was formed in the same of the sufficient possible to the sufficient possible to the river, the latter was diverted through the culvert and the 8-feet hipes were removed. Some interesting work was done to building the roof of the tunnel, a series of framed steel brackets or cautilivers being planed on each side of the opening, from which the wooden forms for the arch of the tunnel were supported. Thus as the measure was ledd, as writes of

above mean sea lovel. Its thickness self; the first sea shot at the creet, the maximum thickness of this base shot at the creet, the maximum thickness of the base shot side of the maximum thickness of the same shot self sea shot self sea shot sea

The Beaver Kill dikes, which have a total length of about 2.3 miles, will have a maximum height of about 110 feet above the original surface, and they will con-



Cross-section of the Hudson River near Cornwall, showing how the Catakill water supply will be carried under the river in a pressure tunsel in the solid rock 1,200 feet below tide level

The accompanying photographs, for which we are indebted to the Mas Arthur Brothers Company, who are the second of the second of

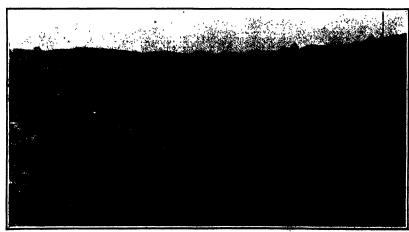
havy aired I beans were placed transcency to the air of the tunnel from which the forms with their apper in umbent load of masoury were suspended by vertical tir-code. To facilitate the flow of the water, the wooden forms will be left to place until the dam is completed. Then the flow will be diverted, and the tunnel will be filled in with masoury. When this completed the filling of the reservoir will take

The top of the Olive Bridge dam will be 610 feet

tain about 5000,000 cubic yards Like the earthen portions of the Olive Bridge dam, they will be built with a concrete core wall. The reservoir will be divided by a dike into two basins. This dike will have a length of 1 life fore, and the dividing well will have the same length.

It will be readily seen from these figures that the

It will be readily seen from these figures that the Ashokan works are on an immense scale. They in volve over 2,000,000 cubic yards of earth and 425,000 (Continued on page 249)



Valley of the Esopus Dam is foreground with river flowing through completed perties of temporary tensol.

BUILDING THE GLIVE REIDGE DAM FOR THE GATHRILL WATER SUPPLY.

#### Scientific American

All monograms German Fatout Sections.

A very important case was recently decided by the Saprima Court of the German Empire, First Civil Sensits, in which the rights of American patentees in Gurmany are defined. The facts in the case are briefly

The National Cash Register Company of Berlin. The National Cash Register Company of Berlin, a limited liability company incorporated under the Ger-man law, is the owner of three German patents. In Germany the patentee must work an invention within three years from the date of publication had expired for all four patents Proceed That term expired for all four patents stituted by Schubert & Salzer Machine Works in the Imperial Patent Office to revoke these patents on the ground that they had not been worked to an adequate stent in Germany, and that in all their essential parts the cash registers protected by the patents were manu-factured by the National Cash Register Company of Dayton, Ohio, and were imported from the United States Into Germany In its defense the Natio Cash Register Company of Berlin stated that one Ger-man patent had seep worked in Berlin, and that this at was in substantial agree ent with the Ameri can patent covering the identical points of invention, that the other three patents were not worked in the German Empire, but that their revocation would not serve any public interest. The Imperial Patent Office revoked all four patents, arguing that the one patent which was worked in Germany was not identical with the American patent cited by the defendant

to American patent circuit by the devicement of the from the decision of the German Patent Office on the promot that the German Patent Office on the promot that the German Patent Office word in helding that the German Patent Office word in helding that the German patent was not worked in Germany, and still setting up the old defence that the revocation of the remaining three patents would not further public intercompant of Patent Patents would not further public intercompant of Patents and the Company of Patents and the Company

The first question which came up before the court was whether the American company could be permitted to act as the defendant on appeal its view of the fact that the Gorman company had been the defendant when the action was brought before the Gorman Patter of the Company of t

Used was reversed.

In the way important decision, and and reference of the data of the start position before the difference courts, so far as forfaiture is concerned they as German scapiect. It is usually the object of a breaty to seem's equal rights to the contracting participation of the start position o

The garvier impolement.
The questing article of the current Economics, in the Jan. Banner, Director of the Department of Research in Terrestrial Magnetism in which has describes the instruments and methods of the codes magnetic work of the Cornegio institution of Wash-

Ingion The article is taborately illustrated. Extended from affairing solution in the case of Weight repairing a parallel and a solution of the content of t

### A German Antaretle Expedition,

A German south polar expedition has been virtually arranged by Lieut Filchner of the General Staff, under the auspices of the Geographical Society Lieut Filchner announced at a meeting of the society that the expedition would start in October of this year if

the expedition would start in October of this year if the nocessary funds were forthcoming.

The plan is to send a vessel with provisions over the orate followed by Lieut Bhacktion and form a depot at about the half way point to Shacktions' winter headquarters. The require regoldtion would start later from Weddell Land on the opposite side of the opposite side opposite side opposite side opposite side opposite side opposite s

Dr Pentk, chairman of the Geographical Society an nounced that an anonymous donor had given \$75,000 toward defraying the cost of the expedition, and Lieut. Filchner had promises of a further \$15,000 It was hoped, he said, that they would be able to send out two vessels in order to save time

Lieut Filchner is an explorer of experience lie was one of the first to reach Lhassa, Tibet, and in 1903 and 1905 he explored Turkestan and Persia

#### The Life of Hadium

An interesting and informative popular lecture upon the wonders of radium was recently delivered before members of the Authors' Club in London by Si William Ramsay, KCB in describing the wonders of this element the eminent chemist confined himself mainly to a description of his own investigations and In dealing with the Alpha particles he ed that these were really gas, and quite twoexplaine capiamed that chose were really gas, and quite were thirds of the energy of radium was transferred to the gas which it emitted, which comes off at a regular rate, and this he pointed out raised the question as to how long radium would last. He replied for over, as the amount of gas was always proportionate to the amount of radium present. He likened this emission of gas to taking a silee of bread and cutting it in two ch operation say overpled a minute, and th ting one-half in two again, and so on continually out ting in two each successive half obtained. How long would it take him to cut the bread entirely up? He uld never do it. He would always be halving to infinity and the task would take him an eternity to It was exactly the same with radium ount of gas was always proportionate to the mass amount of gas was always proportionate to the mass of radium existing and was always being produced. There was however, he remarked, one point castly defined When would radium be half gone? They had just measured it in his (Sir William's) labora-tory and had found that it would take 1,750 years so that anyone who invested in radium would retain at least one-half of the capital at the end of 1,750 years The Austrian government some time age in trusted him with about half a gramme or one fifty fifth part of an ounce of radium for his private use Its value was about \$45,000 Less than a year ago Dr Gray and himself performed the experiment of Dr Gray and himself performed the experiment of isolating the Alpha emanation of radium, and they included it in a fine giasa tube, much their than the finest thermometer tube that was ever made. They compressed it and liquefed it. In the latter stage it, shose with a purplish light, although it was quite transparent like water. When reduced to a tempera-ture of -00 dec Cent it collided and then it per with an extremely brilliant light like a ministure of the control of the control of the control of the performance of the control of the co with an extremely ordinate agent law a manager electric are light. The quantity they used was extremely small, being less than the point of the finest needle, yet they ascertained its boiling point, its melt

Radium was the most concentrated form of energy known It is a substance which goes on changing into other things to which various names have been

ing point, and its specific gravity

given These substances were named radjum A, redum B, radium C and so on up to radjum P Some had a very brief existence insting only thirty or forty mitutes, and he had never seen them. It had seen radjum D which would be gone in about forty years. This was a substance where dull nothing like lead were other substances probably like pointsim which Madame Carlo disevered During the . manations radjum gave a great deal of energy generally manifested as light but see matter of her radjum kept listed hot, there was a great deal of heavy listed hot, there was a great deal of heavy for the reduced in the control of the radjum kept listed hot, there was a great deal of heavy for the reduced in the control of the radjum kept listed hot, there was a great deal of heat gone radjum of the control of the radjum kept listed hot, there was a great deal of heat gone radjum kept listed hot, there was a great deal of heat gone radjum kept listed hot, there was a great deal of heat gone and the great listed was a supplied to the control of the

given off by the oxylpringen blowpipe, which gave a temperature of aver 2500 og Cent.

What did this 'mergy do' it sent to the Alpha rays at a velocity of about 4000 miles per seend, and these partities naturally carried a great dal of overey. The Dear arays, although only about our thou sendth sent of the site above carried this control that of the Alpha rays. They could decompose water and metallic substances, and in these decompositions that of the Alpha rays. They could decompose water and metallic substances, and in these decompositions that of the Alpha rays. They could decompose water and metallic substances, and in these decompositions to arise in the substances so treated. For instance in documposing ordinary copper sulphate they were surprised to discover lithium in what remained, and no traces of the copper sail. He had repeated this experiment fee times, and the experiments were still scoling on

|          | Kpheme       | ris of Halley's | Comet     |                                       |
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Prizes for Small Aeroplanes,

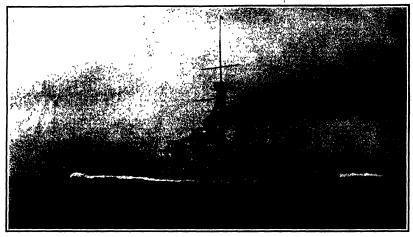
The practical utilization of the acceptance is the object toward which the efforts of all constructors and experimenters are directed in furtherance of heam object, the French National Aerial League offer two prires for small and easily managed sevepaines from prire, offered by M Rued Arment through the agency of the League, will be awarded to the first set of the first set of

The number of bacteria constant in sulfa invesses very rapidly from the moment of milking for a sertain time, and then slowly decreases. Some bacterilordist have attributed this plan moment on a bacterilordist have attributed this plan moment on the bacterilordist power possessed by the milk due to some unidentified professes and produced the plan moment of the desired produced a substance which appears to remain series up to a temperature of 1 of deg F The milk was filtered broads a providing critique, and the fiftrate was filtered broads a providing critique, and the fiftrate many milk, but no consistent centure were delating. The results were delating the much simpler The addition of the permitted of the providing the continually increases with age and thus milk continually becomes a use favorable medium for the growth of hact ria. The bacteria also have to contend with the late for means the development of the permitted of

THE BRAZILIAN BATTLESSIP "RIFAS GERAES" in the early part of this year the first of the dread nought battleships the Muass Geraes" about which much speculation has been rife, was handed over by the builders, Sir W Q Armstrong, Whitworth & Co

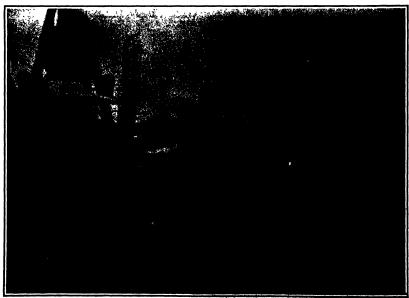
of Elenick, Newcastle-on Tyne, to the Brazilian government thus definitely disposing of the supposition that the vessel was designed for some other power This vessel has been the source of considerable discussion, since it represents the last word in heavy bat-

ticably design, and is at present the most payerfully arised warship adost. Through the courtesy of Admiral Maurity, the president of the Brazilian naval commission in England, appointed by the government of the South American state to supervise construction,



Length, 60 feet. Breadth, 86 feet. Normal displacement, fight, 1400 ton. Horse-power, H.H. Speed, H. & toots. Armors. But. blmb, extending for full height of hell, turned, blmb; two protective derks. My not not for two Armoneums: Tweire-desibles likely, twenty two Crust. Pow tourpeds tables.

TER BRAINGERS WITHER SERELES."



Busing the gun trials of the "Bians Gernes" ten 15-meh guns were trained on the breaksile and discharged simultaneously. The combined energy of the projectiles amounted to 500,000 foot-tom, or sufficient to lift the pair hedily 26 foot larts the air.

we are enabled to publish the accompanying photographs and to give the leading particulars regarding this, the latest freadounght.

The general appearance of the vessel may be gathered from the accompanying illustration. The oversil length is 548 feet, modded breach 33 feet, modded all length is 54% feet, molded breadth 33 feet, molded depth 44.55 feet, displacement 19,000 tons, speed 31 knots. The propelling machinery, built by Vickens Sons & Maxim, who have the second vessel of the series completing at Barrow, is of the reciprocating four-cylinder triple-expansion type, driving twin three-bladed propellers. The critinders have a diameter of 29 inch 39 inches for the high-pressure, 63 inches for the inter-mediate, and 73 inches for the low-pressure, with a common stroke of 43 inches, and on the forced draft trial at 280 pounds pressure developed 27,212 indi-

ated horse-power, giving a speed of 21 4 knots. The outstanding feature of the vessel, however, is and outstanding feature of the vessel, however, is the armament. The main armor on the broadside amidahips is 9 inches for a depth of 22.3 feet, 5 feet of which extends below the normal load water line. The forward and aft barbettes are protected by a trans-The forward and are partiettes are protected by a trans-verse 9-inch armor bulkhead, while forward and aft the hull is protected by 6-inch bolt armoring tapering to 4 inches at the extreme ends tective decks, the upper being 1.25 inches thick, and the water-line deck 2 inches thick Nino-inch armor is also used for the upper strake amidships, and the 4.7 ch guns of the secondary armament are mo inch guns of the secondary armament are mounted with in the citadel thus formed In regard to offensive arm

ament, the main twelve 13-inch 46-caliber guns Four are carried in pairs in two in center line of the ship, both for-ward and aft, the remaining two
pairs being
mounted on either side amidships in order to permit e to be trainthese to be train-ed throughout a full are of 180 degrees, the super structure is cut away fore and aft. It will be readily seen that the upper deck of the vessel is left clear of all obstruction, a factor the outstanding features of the de sign It will be pairs of guns for-ward, as well as those aft, are stepped, the uppermost pair be 12 feet above the level of those below, so as to enable the up-

per to fire over the lower pair It will be seen from this arrange-ment that a terrific gun fire can be concentrated on either side, for the forward and aft two pairs of guns to the side, for the forward and aft two pairs of guns the side of the can be trained through an arc of 150 degrees on either side of the center line of the ship, thus giving å fire from either broadside, including the pair of guns amidfrom either broadside, including the pair of guns anid-ships of ten 18-inch guns. Moreover, owing to a pair of guns fore and aft being sot at a higher elevation, they have a corresponding advantage in action. As have a corresponding advantage in action aguns fire a projectile weighing 850 pounds, this it that an aggregate discharge of 8,509 pounds concentrated from either broadside. In the acthese gu companying photograph taken during the gun trials de fire is shown, and this is interesting as it is the first occasion on which ten 12-inch guns have been fired from a broadside. Similarly owing to the amidship guns on either broadside being capable of training through an arc of 180 degrees, it is pos-sible to fire eight 12-inch guns ahead or astern.

able to fire eight 15-luch guns ahead or astern. The secondary armanent comprises 47-inch guns and 2 pounders of the quick-dring type. The central superstructure of the vessel has been so designed as to carry four 4.7-luch weapons arranged in pairs one above the ether on either side of the bridge at the forward end, with a simple dispersion aff. These guns fire forward and aff, partiall with the control line of the ship, but have a considerable ships of fire sharf the beam. Also set a beyenders are similarly monated forward and aft in the same superstructure, while two other 2-pounders are carried on the top of each of the

gun houses of the upper level pair of guns. On the main deck there are seven 47-inch guns mounted with-in the citacle of 9-inch armor on either side, and the arrangement is such that the guns can be trained through an are of 26 degrees on either side of the cen ter line transverse to the keel, so that they can be trained astern and ahead Altogether there are twenty two 4.7-inch guns included in the secondary armament The result is that is action the vessel can pour a broad side from ten 12-inch guns firing 50-pound shells, eleven 47-inch guns firing 50-pound shells, and six guns firing 3-pounder projectiles. As all are of the latest quick firing type, a comprehensive idea of the formidable character of the attack of this vessel may be obtained

rating mechan The gun-op hydraulically driven, electricity being used for training the turrets. In addition there is emergency gear for every operation. Immediately the gun is fired an or every operation immediately the gun is free an air blast cleans it and the rammer is fitted with a water spray, so that in the event of any sparks remaining when the breech is opened they may be at once extinguished. The arrommodation for the per sonnel is most adequate and commodious especially in rd to the officers' accommodation, and in view of the hot climate in which the vessel is to be in service. special attention has been devoted to ventilation navigating bridge has outer wings, which are also re-moved when the ship is cleared for action. The gunnery trials created unusual interest, and



This graceful structure, recently completed, takes the place of a primitive rope ferry.

#### THE FIRST METAL BRIDGE TO BE RESCUED IN AVGRAGISTAN.

the representatives of several powers were present therest. The trials served to dissipate conclusively many apprehensions that had formerly been enter tained For instance, there was considerable discussion as to what effect would be produced upon the gun crew in the lower barbette of the fore and aft 12inch guns when the weapons immediately above were discharged. In the first test the crew were withdrawn from the lower gun house when the upper pair was It was found, however, that the roof of lower house offered a complete protection against the blast, and that the crew could safely stay in the lower house without experiencing the slightest ill effects of the tremendous blast some five feet above their heads It was also considered that the principle of setting the fore and att guns one above the other and at a dis-tance of 36 feet center to conter was objectionable, on the plea that the aiming of the upper guns would be end with by the flash from the guns just be interfered with oy one man from the gules just below, but here again practical trials dispersed any such ob-jections. These results, by the way, corroborate cer-tain results obtained some years ago by our own Navy Department at Indian Head, when this syst counting, first proposed and adopted in our an" and "Bouth Carolina," was tested.

Cement for Aquaria - Equal parts flowers of sulphur, pulverized sal ammoniac and fron filings, mixed with ed oil varnish and adding enough white lead good linseed on varmen and secting on to make a solid, easily workship mass.

THE PIRST METAL BRIDGE IN APPRAISITAN

The accompanying illustration represents the Di-roomtah suspension bridge, the first metal bridge to be erected in Afghanistan, which was opened last year. The structure apans the Kabul River at the mouth of the famous Diroomtah Corgo about seven miles from Jaliabad Prior to the erection of the bridge communication was maintained between India and communication was maintained between inqua sine the adjacent country by means of a primitive native forryboat, or raft, composed of akins stretched taut on a framework of rough timbers, and lashed to-gether by means of crude native-made rope. A cable was stretched across the river, and when the latter was at its normal stage the raft was pulled from one bank to the other by this means When, however, the waterway was in flood, and the turb velocity of the current prevented recourse to the rope the raft had to be rowed across the river, an operawhich required considerable dexterity with the primiwhich required considerable destretty with the primitive cars used. The journey was somewhat dangerous under the circumstances and the opposite bank was only gained some considerable distance downstream. Owing to the rude character of the ferry-boat a capsite was by no means infrequent, and indeed several lives were lost from this cause every

chosen for the structure was just off the old Kabul road As the photograph shows, the gorge is extremely wild at this point, the rocky cliffs dropping straight down

The contract was carried out un Mr J R Halli day by the Cai-cutta engineering firm of Messrs. Rurn and Company, Limited

The bridge has a enen of 396 tower centers. width between parapets of 10 feet. It is designed for pedes-trian and light vehicular treffic character of the with the fact that none but un skilled native labor was available, rendered the task somewhat diffi The abutments had to be solid rock, as did the roadway approsches on either side On the these preparawith the setting of the foundation bolts were con

pleted in seven and a half weeks. Work then had to be auspended for seven months, as the services of the Afghan labor was required in Kabut Upon resuming operations, work was continued without further inter nission and the bridge was erected in the actual corking time of five months. Considering the nature of the work, and that the native laborers were quite unacquainted with the tools used such a performance was highly creditable A further month however was d in blasting out a roadway and approach to occupied in blasting out a roadway and approach to the bridge in the cliff face on the Lagna side of the river. The bridge was opened by His Majesty the Amir of Afghanistan amid much ceremony and before huge crowd of natives, who lined the precipitous hillsides to witness the novel spectacle

Until a few years ago, all public coal lands were Dutil a few years ago, all public coal lands were valued unformly at a raise of 320 or 510 an acre, ac-cording if they lie less or more than 16 miles from a railroad Silver July 1906, the government has been appraising its coal land according to the value of its contained coal. The present value fixed for the government coal land, based on the new requisition, is 184(77,344), the value fixed for these same coal lands before the new classification was adopted was \$48 240,971 According to these figures, it is evident, there-fore, that if these lands had been sold at the prices prevailing before July, 1906, they would have brought the government about \$190,000,000 less than their value

#### BIRDS AS MEGRATISMS

ST S S SOUDISM.
The casual observer knows the birds as he knows the tree the stone or the sea shell—an incidental object of passing interest, one of the trivial details in his every-day life. The novice bird student knows in his every-day life. The novice bird student knows the birds, few or many species, by the clothes they wear no to speak. If somewhat adept, he may even revenue birds by flight and song Even the more profound ornthologist classifies birds by external character—largely bill feet, length of wing and tail, number of feathers in each, etc. He is of necessity a specialist paying particular attention to classifica tion pterography of the study of plumage ornith ological osteology or some one of the sub-divisions of the ceneral study of birds. Lew individuals among appreciate the bird as a mechanism designed to play a certain part every member like every detail of some complicated and perfect machine contributing toward perfecting the whole for its requirements Considering the bird from this standpoint and

100

analyzing the parts with a view to their functions it seems natural to con mence with the bill cause it is the anterior extremity and because of the importance of its a birds mechanism article capecially devoted to it and has, in fact ceived such treatment. It be briefly reviewed here The bill not only performs the func-tions of a mouth in birds, but also serves as a hand posterior limbs, and only unsatisfactory substitutes on the anterior ones. bill largely in lieu of a hand, and do so to a very considerable degree

As has been shown, the

as has been shown, the bill largely conforms in shape to the requirements of the more important functions that it must very wide range of vari ety in sise and shape It is used for cutting tearing, and chewing fo various sorts, and for seizing, spearing, or en-guing prey It is also used to dress the plumage, and by some species, such as parrots, to assist in climbing Birds' skulls, having a

less diverse range of functions than the bills, correspon amaller degree of differ entiation, but they do vary to some extent according to the habits and particularly according to the orders. In the lower types, such as greb and most of the sea birds, the brain cavis relatively small, but proportionately large

in the higher types, such as the thrushes including

The vertebral portion of the skeleton plainty indicates the bird's descent from senestral stock common with that of reptiles. Modern birds being no louger provided with reptile-like tails, as was the case with the earliest types (the archeapteryx had twenty cauda the earnest types (the archeaptery man weathy caudain vertebres the bony structure of a long lisard like tail, each vertebra supporting a long feather on either side) the number of caudal vertebre has become re-duced to usually nine and these are short and with little apparent function, other than to support the feathers of the tail, fan like, about the outer bone

The bony structure of the wings is an adaptation of the bones of fore limbs to the requirements of flight In evolutionary history this adaptation was princi pally accomplished in the lizard like progenitors of birds and the modifications since then are not remarkable. The main arm bone the humerus and the secondary ones the ulns and radius are not very differ

titled Bills by B. S. Sowdish, Augertean Bonnes and Cardina, July 1993, vol. iii, No. J. pp. 85-87

ent from the corresponding bones in man the hand, however, the first and fifth fingers have disappeared the index and third digits are small and scarcely functional, while the middle finger is greatly developed and furnishes the real bony support for the tip of the wing
Wings for the great majority of birds are solely

organs of flight, in a few species such as the ostrich they are rudimentary and functionless serving at best only to preserve symmetry in such species as

best only to preserve symmetry in such species as ponguins, howevor, while useless for flight, they are valuable as flippers or paddies, assisting progress through the water in a very two cases they are used to assist the bird in timbing usually largely while immature, as in the hoatsin of South America
Next to the bills and wings the feet of birds are
perhaps of the greatest functional importance. Feet

and logs vary greatly, according to the usage for which they are designed. In the ostrich, which most nearly resembles in its mode of life some wild horse the development of feet and legs is strikingly like that of the feet and legs of such animals. Birds like

the birds than the skeistal structure. The more i the pires than the sketstal structure. The mere im-portant nucles are peculiarly designed to reader the greatest efficiency. The powerful muscles that operate the wings have their anchorage on the keel of the breambone, and the latter is particularly deeply developed in birds of most powerful flight. This is true alike of the man-of war bird, with its immense wing area to maintain spread for hours in sailing, and of the humming bird with its relatively small wings. driven at lightning speed to keep the bird pois fore a flower

In all of the passerine or perching birds, the muscle and tendon arrangement of feet and legs is such that the weight of the body resting on and contracting the the weight of the body resting on and contracting the legs draws the muscle over the main joint, and draws up on the ends of the toes, looking their grip on the perch. The same principle drives the talons of the hawks and owls into their prey

hawks and owis into their prey
Tongues in birds are also highly functional In
woodpeckers they are practically barbed spears, and
the extreme protrusion that they are subject to is
provided for by roots that extend around the back

of the head and clo to the eve-sockets In the humming bird the tongue is a pump for obtaining the nectar from flowers. In some species it is brush like, to facilitate handling the food, and in certain fish-eating species the upper surface of the tongue is covered with points inclined backward, lo facilitate awallowing the slippery prey
The eyes of owls, de-

signed to see at night, are wonderful structures Only a small portion of the entire eye-ball is visible Each so ket occupies nearly a third of the total skull space The visible eye-ball is mounted on a thin bone frame, some-what resembling a lampshade in shape, a struc-ture differing radically from the type of bird's

The feathery covering of birds is especially adapted to their requiresubjected the penguins it is more like the hair of seals than thoroughly waterproof greatest supporting area for the air pressure to act

ments It is light offer-ing the least weight to be carried in flight, and a poor conductor of heat and cold, affording the bird the best protection in the sudden temperature In birds like The feathers of ducks and water fowl generally are ulso practically water-proof The power of flight is quito dependent on the feathers both of wings and tall which in action





the kingfisher and humming bird whose feet are t solely for perching have absurdly underdoveloped, small, and weak looking feet and legs. In the birds of prey the feet are practically grappling hooks, de-signed to secure the firmest hold of the victims, the legs are heavy and strong Birds like the hero storks, and eranes, who spend much time wading, have very long legs and long, slender toes, which, spreading over a wider surface, give a support ana-logous to that afforded by snowshoes. This feature is more strikingly illustrated in birds like the rails, that travel about on the yielding aquatic growth, and finds its highest development in the jacanas, tropical finds its highest development in the jacanas, tropical and sub-tropical Jirds of the rall family Wood-peckers creepers, and nuthatches, birds that clins a great deal to perpendicular surfaces, have very sharp claws and feet adapted to such requirements. Birds that swim a great deal have the feet webbed with a membrane extending between the toss, making very officient medical process.

efficient paddles

The flesh of birds is no less efficiently designed and
disposed toward the fulfilling of the requirements of

ism, so perfectly do all its parts contribute to an absolutely smooth-working whole, in the bird, that the very wonder of this

Metal filament lamps generally are supp of a pretty frail nature, so that the alightest touch breaks them. This idea is counteracted by an account a Pennsylvania eastbound passenger train and an empty engine just outside Jersey City on the morning of November 8th This accident resulted in comparaof November 8th This accident resulted in compara-tively few injuries to the passengers, due to the fact that the strong frames of the passenger cars resisted crushing The damage to engines and cars, however was considerable. One of the steel passenger conclus-jumped the track and turned over on its side, desting in the steel plates about 13 inches. Included in the lighting equipment of this car were nine tangates, lamps, and it is interesting to note that, after-to-week three lamps were found to be in perfect dos-week three lamps were found to be in perfect dos-

#### Scientific American



### EXPERIMENTS IN CRYSTALLIZATION

The making of crystals of various kinds outside a chemical works or chemical laboratory is not often practised, because it is commonly considered that the subject is a very difficult one or that it requires a complete knowledge of chemistry Such however, is a mistaken idea from either standpoint Crystals of extraordinary beauty both in geometrical form and brilliancy of color can be produced by any person debrilliancy of color can be produced by any person de-termined to make the undertaking successful.

The accompanying illustration shows a group of py-

amidal crystalline structures that have been form in the national colors

The red is made of bichromate of potash, the white of common alum, and the blue of sulphate of copper

Many salts can be employed that are very cheap, and after the crystals have been formed the solution left over can often be used. The geometrical forms of the crystals can be observed during their formation, and it is interesting to watch how they grow as the liquid deposits the excess of sait. When finished, they can the excess of sait be dried and preserved under a glass covering like wax flowers so as to preserve them for ornament and war flowers so as to preserve them for ornament and for educational purposes To produce results as illustrated make a pyramid

out of three pieces of wool five inches long, and a quarter of an inch square. Wind each stick with cot ton twine from end to and Bind these three st well at the apex of the ovramid and then for the base nake a little triangle of the same sized strips each pince being two and a half inches long. Coment these piete being two and a nair milest long. Cement these firmly at the corners with swaling wax, then cover every part neatly with a winding of cotton twine. Now distend the free ends of the three longer pieces, and fasten them to the base with sealing wax after which carefully cover all the waxed parts with twine For a fine pyramidal block of white transpar ent crystals prepare a small quantity of concentrated alum solution made by adding powdered alum to pint of boiling water until no more will dissolve. Dip the cotton twine covered tripod or pyramid into this solution, let it soak for a minute, then stand it in a plate to cool. When cold it will be coated all over plate to cool. When cold it will be coated all over with very fine crystals of alum. This is the starting point to build up the flual crystallization. Examine the minute crystals with a magnifying glass, when it will be seen that the face of each crystal is triangular the corners being out off small or how large the crystal may be, it always asmes the same geometrical form, for every sait crys tallizes in a form according to its nature

tainings in a form according to its nature.

Proure a two-gailon stoneware trock and a one-gailon glass battery jar. The battery jar should be eight inches high and six inches in diameter. Pour even pints of boiling water into the stoneware crock. Add thereto about five pounds of powdered alum, a fe

ounces at a time stirring the solu tion well with a clear strip of glass. As soon as the hot water will dissolve no more alum it is then saturated and must be poured into the glass battery jar, which has been previously warmed, straining the solution of alum by tying a three-fold place of che cloth over the top of the jar Now place in the battery jar a circular-like lid about ¼ inch deep, such as the lid of a paste jar Sat upon this lid a place of glass four and a half inches square and upon the glass the slightly crystallized pyramid completely immersed in the solution and weighted down with a large alum crystal or a beavy glass stopper A small crystal of alum may also be tal of alum may also be ed upon the top of the pyramid

placed upon the top of the pyramid All must now be left to cool gradually. Under io confliction must the wessal be distribed, because the would cause the alum to be threen down in a few minutes in very fine crystals like common said.

At the end of west-four hours, the whole of the pyramid will be covered with beautifully furned crystals. At the end of torty-eight hours, the pyramid may be removed, and the slum believels make hot over anows. adding more ground alum to saturate the solution; nour this solution again into the Battery far and insert the pyramid with the sheet glass base, allow this to

stand for a week, when it will be found to have become a mass of beautiful crystals, clustering into one solid mass. The pyramid must now be removed (the glass plate also by a slight tap) a pint of clean, cold water poured over it, then stood upon folded blotting paper to drain changing the blotting paper twice daily for a week to nine days, when it will be found that the crystals will become almost transparent. The pyramid being complete it may now be covered with a suitable glass dome and it will form a unique and instructive ornament Several sets should be made from various salts, in various colors All of them can be carried out

ely the same manner as described for all The following salts are not expensive and will give the various colors stated They will not become moist upon exposure to the atmosphere For white common alum and cane sugar, red potassium bi chromatc, yellow, yellow prussiate of potash, dark green, double sulphate of nickel and ammonia light chlorate of nickel

There are very many other salts that will give a



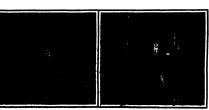
RED. WHITE, AND BLUE PYRAMIDAL CLUSTERS OF

great variety of colors the majority of them being deliquement becoming moist and melting upon ox posure to the atmosphere but those enumerate

#### SIMPLE METHOD OF PRODUCING THE ZERMAN REFECT BY W & (40)

The world was startled when a few years ago, Pro-Zocuma amounted that if pieces of sodium were burned between the poles of a powerful electromagnet the spectroscope would show the D line much broadened while the axisting current was turned on, and that the original aspect of the line would be reed as soon as the current ceased

The experiment confirmed the much-discusse The experiment continued in more unusual control of the chemistry of the Lorentz who assumed that the litherte bomogeneous and indestructible atom of the chemistras as a matter of fact heterogeneous and composed to the chemistry of the chemistr of minute particles or vortices in the other of space, having a definite mass and possessing all the proper ties of negative electricity. These particles, or vor-tices, which are now called 'electrons' he conceived as vibrating about the common center of gravity of the atom and further that light was due to trans-verse vibrations in the ether generated by these rap idly moving electrons if argued Lorentz, the atom up of such particle e or vortices, their rate of vibration would be altered by the lines of force in a magnetic field and we should be able to predict their behavior with accuracy. Going back to two swinging pendulums for analogy, he pointed out that any mo-



APPARATUS FOR PRODUCING THE SEMMAN REFERT

tion to which the electron is subject could be resolved into three components one in straight lines parallel to the lines of magnetic force, and the other two at right angles to them, but since these last two can be truther rooted into two circular motions (one to the sight and one to the left) around as axis parallel to the lines of force, we can say that the motion which to the inject of force, we can say that me motion which the electrons are, capable of making may be divided into component number 1 in which the electrons are moving parallel to the lines of force; component num-56 2 in which they move with the hands of the clock.

and component number 3, in which they move against the hands of the clock. Now suppose we look at the vapor of sodium in a magnetic field and along the vapor or section at a magnetic neighborhood along the inlines of force Consider the electrons an angalitely charged, and the lines of force runnin oward you what will happen? You caunot see any "feet of component number 1, since the electrons o that component number 1, since the electrons o that component nent are moving in the line of your vision and since electrons emit waves only at right angles to the line of sight, hence to see the waves of component num ber 1, you would have to move your position and look at the burning sedium at right angles to the lines of force But with components numbers 2 and 3 the conditions are very different. Here the electrons are revolving in circular orbits and in a plane at right angles to the line of sight, and since those which move with the hands of a watch are retarded, and those against the hands of a watch are accelerated the single line seen in the spectroscope would split into two, or as in Prof Zeeman's case, where the spectroscope was of small dispersive power only a broadening of line would be observed. This then, was the experiment which startled the scientific world, startled it because one of the fundamental principles of science was apparently overthrown-the homogeneity of the atom of the chemist

Notwithstanding its value and significance, the experiment is rarely witnessed because of the pond ous and costly apparatus necessary to produce the di-vision of the spectral lines. Powerful gratings and magnets both exceedingly expensive have up to the present time been used in the demonstration. The writer however has a very simple piece of apparates costing less than \$40 with shows the phenomenon admirably. No claim to ortiginality is made save in the matter of its arrangement which is no simple as to be well within the grasp of any intelligent boy. instead of the powerful spectroscope the reader will observe in the accompanying photograph a little inter ferometer attached to the triescope. This is a modification of Fabry's and for it the writer is indebted to the inventive genius and the exquisite mechanical ingenuity of Prof Pfund of Johns Hopkins Univer-sity And instead of the huge magnet used by Zeeman one weighing less than forty pounds is found more than ample. The photograph shows a piece of board six inches long to which is attached A a lens of three inches focus, B a Nicol prism which can be revolved in its brass collar C the interferometer D the telescope and O a spring ellip for holding the quar ter wave plate. This apparatus is simplicity itself is always in adjustment and can be rapidly shifted to view the phenomenon along the line of sight and at right angles to it

Instead of burning sodium let us use a tube con taining helium gas, and place the apparatus se we may view the light parallel to the lines of force and through the hole drilled in the pole piece of the magnet as seen in Fig t. Examine the glowing tube before the magnet is energized and you will see several concentric yellow rings in the field of the tele-

Fix your attention upon any one of the rings which is the equivalent of the yellow line that would be in an ordinary spectroscope Turn the current into the magnet, and lastantly the yellow ring splits into Revolve the Nicol but you cannot extinguish the rings because just as Lorentz predicted they are circularly polarized. Now introduce a quarter wave plate the effect of which is to

produce a retardation of one-half wave length. The light is now plane polurized and can tinguished by the Nicol—a further and a beautiful confirmation of Lorentzs theory. Ho much for components numbers 2 and 3 but component number 1 can not be seen since its electrons are moving parallel to the lines of force. Now take out the Nicol and move the apparatus so as to view the light at right angles to the lines of force (Fig. 2) Turn on the current yellow ring is observed to break up into three Let us analyze them bearing in mind what Lorentz said viz That one of these lines component number

1 was polarized lying in a hori-e, and that the other two, components num bers 2 and 3, were polarized in a vertical plane ver-tical because in this position we are looking at the edges of these circular vibrations, and the effect upon us is as if the particles were actually moving vertically now introduce the Mool with its short diago-nal vertical, two rings appear, and with its short diagonal horizontal one ring appears a beautiful con firmation of one of the cleverest places of reasoning two refedited to the midd of man. In the whole resim of physics there is nothing mor-

striking, more significant, and the effect which it is destined to exercise upon the future of science is simply incalculable

#### SOME SIMPLE TESTS FOR OILS.

There are several tests which anyone can apply without the use of special apparatus, and tell something about the grade of lubricating oil he is getting THE PLANT TEST

Piace a small amount of the oil to be tested in a



APPARATUS FOR DETERMINING THE FLASHING POINT OF OIL

pan as indicated at a in the accompanying engraving, pan as indicated at a in the accompanying engravity, and heat by means of the lamp beneath As the oil heats apply a match at b. After a time a flash is seen when the match is applied, but it disappears as rapidly as it came. This shows that enough vapor had been produced to milk with the air and form an explored mistare. The temperature, given by thermometer, at which this over, is called the flashing point, at some higher temperature if a match is applied, the oil takes after a "This interest measures is considerable," the oil takes after a "This interest measures is considerable. oil takes fire This latter temperature is known as the burning point, and may be a considerable numb of degrees above the fashing point.

### TO DETECT THE PRESENCE OF AN ACID. Dissolve a small amount of sodium carbonate in an

equal volume of water Place it, together with the oil to be tested, in a flask or beaker and shake thoroughly The quantity of precipitate will be a gage of the amount of acid present.

TO DETROT THE PRESENCE OF GRIT Drop a small amount of the oil on white or very light-colored blotting paper. The oil will be absorbed, and the grit will be visible as small black specks on

TO FIND THE TYMPERATURE AT WHICH THE OIL CONGRALS Put 15 parts of Giauber saits into a beaker Place in this a bottle containing a sample of the oil. Place over the sait a mixture of 5 parts hydrochloric acid and 5 parts of cold water The temperature is re-duced slowly, and can be observed from time to time as the oil thickens Any freezing mixture or even to can be used in place of the above

#### THE IONISATION OF AIR.

SOME SIMPLE PAPERIMENTS The terms ions and electrons have now become familiar in the explanation of electrical phenomena Most of the investigations upon which they are based how ever have been made in racuo, and consequently the are but little understood, except by those scientists

who have devoted their energies to their e study There are however many simple experiments, mostly due to Right, which can be made in air at the ordinary pressure, and which form a useful intr ordinary pressure, and which form a useful introduc-tion to the study of icelastion The accompanying illustrations represent some of these typical simple experiments performed by Mr C J Waxda of Bir-mingham, which aroused considerable interest at a re-cent actentific conversations in that city, and through his courtesy we are able to explain how they were carried out and how they may be repeated by any inter-

It is well known that if a pointed wire be con-It is well known that it a pointed wire of con-nected to one pole of an influence electric machine, and the other pole is earthed, a discharge of electric-ity will be obtained. The proof of electric discharge may be easily verified by means of a lighted car and a gold-leaf electroscope if the former is placed on the cap of the latter, the electroscope, even if dis-posed several yards from the machine, will collect continuously the electricity discharged from the u chine Similarly, if the action is carried out in the dark, a small stream of purple light may be seen, which although scarcely visible, will exercise a pronouncedly marked influence upon an exposed photographic plate Another method in which this discharge may be ascertained is to place a condensor, charge may be ascertained is to place a contensor, comprising a piece of glass 1/16 inch thick coated on both sides with tinfoil to within ½ inch of its edge, opposite the point of the wire Then connect the two opposite coatings of tinfoil with a strip of the same material, which has a fine cut in it When the reverse side of the condenser is connected to earth, there will be a distinct spark jumping across the par row gap

If this discharge point then be immersed in a metal If this discharge point teen be immersed in a measu-box fitted with an opening which is covered with per-forated zinc, so that the electrified air is forced through the perforations, if the box is earthed it will be found that the air which is thus expelled is totally deprived of electric charge. It thus appears that the



clectric charge is not carried by the particles of air generally, but by a smaller number of what for the present are generally described as ions. Reversi simple experiments may be carried out to

Reveral simple experiments may be carried out to saccriain the paths pursued by these ions. For in stance, take a sheet of ebonite the reverse side of which is coated with tinfoil and earthed, and place it a foot distant from the discharge point. It is advi-able to pass the abeet over a gas flame for a few seconds before each experiment, so that any electricity present in the sheet may be eliminated When the discharge from the electric machine is carried out for about one second, the sheet will be charged suffi ciently No visible effect of this occurrence will be

observable; but if the sheet is sprinkled with a mix-ture of powdered red lend and sulphur, and the same experiment is repeated with an obstacle of non-conterial interposed between the ducting material interposed between the disoharge point and the sheet, such as say a cross, an image of that object will be produced upon the plate. If nega-tive electricity has been discharged from the electrical point, then the sulphur will collect on those parts

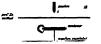


Fig 12.-Forcing a discharge through a size sieve



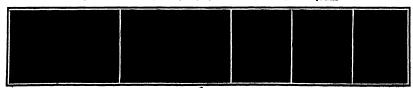
Fig 18.-Rffect of ultra-violet rave on sinc

ediately beneath the object, while the red lead will adhere to those parts charged negatively by unimpeded discharge on the surrounding areas drawing, Fig 1, shows how the experiment is carried out, while the photograph, Fig 2, gives the result of the interposition of the cross in the path pursued by

are image or the object is usually enlarged, but this factor is influenced to some extent by the length of time of the electric discharge. A proferable method is to take a sheet of celluloid, as shown in Fig. 3, perforated with holes at regular distances. Than when The image of the object is usually enlarged, but this forated with holes at regular distances. Then when the image of these holes is obtained, as shown in Fig. 4, the distances between their centers can be measured When the distance of the ebonite sheet is varied (the when the distance or the spontie sheet in wated the distance of the ceilindid sheet from the electric pole being kept constant) it will be found that the size of the image grows with the distance, but not proportionately. The electrified particles or ions travel along the lines of electric force, and consequently generally in curved lines. This has been proved by using, in stead of a point, a long thin wire held parallel to the interposed sheet of celluloid when the lines of force tre circular ares passing through the wire, and strik-

ing the ebonite perpendicularly to its surface
It will also be found that the streams of ions mutually repel each other, so that if the electrified point very near to the celluloid, the individual imof the holes will be found to have enlarged themselves at the expense of the intervening spaces and will even be observed to have assumed almost a square form, as be observed to have assumed almost a square form, as shown in Fig. 7. This is of course analogous for what is observed with the cathode rays of highly exhausted tubes. A similar repution is also manifested when an insulated metal object is used as the interposed ob-ject. This is illustrated in Fig. 6 which represents the effect produced by a place of brass sinking on the ond of an obsolute rod, both bulley of the same diameter (Continued on page 250)

Figs. 8 to 8.—Shadow effects produced by interposing non-conductors in a stream of electrified particles



Figs. 7 to 11.—The effect of an air black on the discharge, and of ferring a discharge through perfected also.



MAKES 19, 1910.

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#### NEW ARROPLANCE. (Continued from page 236)

veight of the machine complete is about 400 pounds from the propeller at 1,200 revolutions is in the neighborhood of 200 pounds. The double surface horizontal rudder is The double surface horizontal rudger is carried upon hollow inclined poles some 12 test in advance of the main surface, and the single surface tail is similarly carried at the rear. The machine is mounted upon a central runner having two amailer skids at each side. There also a skid at each and of the lower plane

The novel features of this machine The novel features of this machine are the foot control of the horizontal rudder, and the system of triangular vertical flus on the top of the upper plane for the purpose of maintaining the plane for the purpose of maintaining the transverse stability automatically. The aviator sits upon a small seat located in front of the lower plane and clings to two inclined braces running out in front to vertical strain connecting the poles that hold the horizontal rudder These inclined braces can be readily seen in the photograph as well as the podals for the feet of the aviator which operate the horizontal rudder. The vertical rudder is worked by a small lever held the aviators right hand, and the spark and throttle control of the motor is also conveniently placed

The theory upon which the transverse fins (each of which has about 2 square feet of surface) operate in order to maintain the transverse stability of the machine, is as follows When the mathine tips to one side it has a tende to slide down toward the ground end wise, but as the weight is placed very low and as the fins offer resistance to this side motion the upper part of the machine is retarded, while the lower part swings over like a pendulum, and the machine regains an even keel

In the first test the surfaces (which are of special paraffin-costed silk) were very loose owing to for and dampness, and once the machine was in the air it was neces-sary for the svintor to sit well over to the left side, in order to counterbalance a difference in lifting power of the two sides of the machine The hinlane rose readily after a run of about 85 feet The machine is said to have lifted at a The machine is said to have lifted at a speed of about 22 miles per hour. The horizontal rudder was turned too far and the machine shot up to a height of 40 feet at an angle of nearly 30 degrees. 40 feet at an angle of nearly 70 degrees Mr Herring attempted to make a turn after flying some 300 feet, and the machine turned successfully though a ward at an angle of about 20 degrees from the horizontal and unaking a 40 degree turn He then cut off the spark and descended In alighting the seat was split and a runner and one of the inclined rods were broken According to the inventor, the machine rose in the air with the aviator (who weighs 190 pounds) with a thrust of 140 pounds, and he believes that a thrust of 80 to 85 pounds is sufficient to fly it throttle was not fully opened, and the motor, he thinks developed not more than 9 horse power when the machine was in flight

This biplane is the first scroplane to fly in New England but it is principally noteworthy because of the new method of automatic stability which apparently ems to work fairly well

Herring has replaced the vertical partitions of the Voisin biplane (which connect the main planes at the ends and at various points in between) by the six small triangular fine shown If these small fins placed above the upper plane, answer the purpose as well as do the partitions in the Voisin machine, one can readily see that they offer much less resistance and skin friction to the air, and should make a much faster ma-chine. They form a means of auto-matic stability which is a decided improvement over warping wings or movable wing ting

(Continued on page 347)



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MUNN & CO., Inc. 561 Broadway, New York City (Continued from page 246.)

One of our illustrations shows the new siplane of Capt T A. Baldwin, the dean of practical American aeronauta. This of practical American aeronauta. This new biplane has a number of original features, thief of which is the method of preserving the transverse stability by means of a single vertical stability rud der placed above the upper plane. This der placed above the upper plane. This rudder is turned about its vertical axis by means of a fork fitting around the aviator's shoulders, as in the Curtiss ma aviator's shoulders, as in the Curtiss ma chine When the acroplane tipe to one side or the other, by leaning to the high side the aviator sets the stabilizing rud-der at an angle to the line of advance der at an angle to the line of advance. This exerts sufficient force to bring the muchine back to a level keel. The new stabilizing rudder is the outcome of .z. periments tried several years ago by the Aerial Experiment Association. It has been tried out by Mr Curtisa, who claims that it worked satisfactorily upon his meehine. his machine

The new biplane has a spread of 28 feet by a fore-and-aft width of planes of 5 feet which makes an area of 280 square feet of the main planes In addition to these there is a small biplane tail (arried on a there is a small oppine tail (arried on a triangular frame extending back from the main planes and mounted upon a light skid. The vertical rudder is placed in the center of this tail which forms in reality the horizontal rudder, since the

reality the horizontal rudder, since the two surfaces are moveable and are used to direct the machine up or down. The arrangement of the power plant and aviators went is just the opposite of the usual arrangement, and is along monoplane lines. The motor is at the front edge of the lower plane and the avi ators seat above the rear edge. The fly wheel of the motor extends below and above the plane. The propeller is placed half way between the upper and lower planes and is driven by chain from the r It is a large, high pitch propeller tween 8 and 9 feet diameter

The peroplane is mounted upon two pneumatic-tired wheels in front and a single skid at the rear. The regular Cur tiss single-wheel control of the rudders is fitted. The machine has had several successful tests upon the frozen surface

of Lake Keuka, at Hammondsport, N Y The latest model Bleriot monoplane known as the "No 11 bis' is shown from the rear in one of our illustrations on page 236. As can be seen at a glance the body of the machine is now complete. covered, while a new form of tall re-embling that of the Antoinette mono plane has been fitted. The horizontal rudder is in two parts hinged at the rear preedge of the tail proper The spread of this new model is 72 meters (236 feet) the wings being about 11 x 7 feet in size and having an area of 12 square meters (1286 square feet) The length of the body has been reduced from 7 to 86 meters (2164 feet) The total body has been raduced from 7 to 66 meters (2164 feet) The total weight is 310 kilogrammes (6826 pounds), or with aviator 832 pounds This means a lift of 646 pounds per square foot of the deeply curved surfaces. The highest lift per square foot hereto fore obtained has been 5 pounds, so M Bieriot has apparently improved his ma chine in this direction although he has not diminished its weight but instead has not diminished its weight but instead heas increased it in order to give it grater atrength. The same 3-yilinder, fan shaped Ausani 55 horse-power alt-cooled motor is used as hevetofore. This motor develops its power al 1 100 revolutions per minute, at whith speed it revolves the \$35 foot Chaurker propeller. The pitch of the propeller is nearly half diameter and the thrust obtained about 200 pounds. This new model is operated the same as his previous machines by a universally jointed control column pushed forward or pulled backward to direct the machine down or up, while it is moved sideways to warp the wings and correct the transverse equilibrium

SIR HIRAM MAXIM'S AMOPTANE authentic details are now available (Couriesed on page 2(8.)

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By R. C. GEORGE
The reader may or may not know THAT INTERER ARE TWO distinct methods of building as estimated to construct it without reference to any other car—the sales am being to build accepted an PEUC (relater buss has placed from the professionare. This is an extraonly SHEPE, models. It is provident are at the size of the sales and the provident are the sales and the sale

considered. "Two years ago it occurred to me that if it were possible at a nonnual control to duplicate my car munu the luxuries that are wholly unnecessary, the car would meet an immense deraund from those who want the vital werking parts of the best care, but who are willing to the loss of the best care, but who are willing to the large 40 is the result."

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ENGER MOTOR CAR CO., Summer and Gent Streets, Cincinnati, Ohio

(Continued from page 247)
concerning the aeroplane which Bir Hiram Maxim has built at Crayford, Kent England No small degree of se Kent languand to small degree of se-crey has been maintained, but to those who are acquainted with Sir Hiram's theories, it was evident that he would hase the present acropiane on the main principles which governed the design of the remarkable machine which he built and tested at Baldwyn a Park in 1894

The present machine is the outcome of his original researches and of plans developed during the last five or six years but not until 1908 was the veteran mor able to devote himself fully to the planning of a new flying mad the pianning of a new lying machine in the also set himself designing a gasoline motor, as he hold the idea that much of the trouble with the present serropianes was due to the unsulfable on the strength of the piant of the control ortions of the machine as compared with those of the gigantic appar The total width of the new aero plane is 46 feet, while his earlier multi-plane had a span of over 100 feet

Like its prototype, the new aeroplane is of the multiplane type, and is in effect made up of six aeroplanes, each being 6 feet 6 inches in width, fore and being 8 feet 6 inches in width, fore and att The planes are notably thin, and are neatly covered with waterproof slik fabric very tightly laced Prom the central plane spring out two super-posed wings, readed will above it, and no curved as to produce automatic lat eral stability to a very high degree There are balanced rudders fore and aft, and a horisontal steering rudder The Maxim patent davice for varying the nitch of the planes when in fight the pitch of the planes when in flight is utilized. This differs from the Wright varping device The wings are move e direction by a lever wo hand, while a spring controls them in the reverse direction

The engine is mounted between the

The engine is mounted perseen to planes, and behind the pilot, who sits in a low metal-covered compartment with the steering and control wheel in trunt of him This disposition gives a very clear lookout, and at the same time the aviator is better protected from the wind A nighty have reacure is the pro-pelling grar. On the engine shaft is one small screw propeller mounted at the rear of the planes. This screw travels at the same rate as the engine shaft, and serves also as a flywheel are two larger propellers each 11 feet in diameter, mounted higher up between the planes and driven by cables whose tension is controlled by jockey pulleys The small screw and one of the large ones rotate in the same direction, the other large one in the opposite direction This screw is also given a finer p and higher velocity than its companion and in this way its gyroscopic action balances the joint gyroscopic action of the two propellers, which rotate in the reverse direction. This arrangement of In the engine, too, Bir Hiram has shown how closely he has studied shown how closely he has studied wvery phase of the problem. He has selected a special brand of Vickers steel as the material for his 4-yilland 7-blorus power motor, and has been enabled to reduce weight while leaving a good margin of strongth Special care has been given to the extructor and the valves Bir litram claims that his ongite works with far greater regularity and smooth with far greater regularity and smooth ess than the average aerial motor used The engine is fully water cooled and the radiator is mount ed under the upper plane in a manner suggestive of that adopted by Santon magnetive of that adoptes to the property of the property of the property of automatic forced feed inductation is employed, SUING & CO., in., Publisher of Section 1.



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(Concluded from page 248.)
which carries oil to every working part
of the engine in a very effective manner.
Indeed, the new motor promises to set a splendid example in aeroplane engi-neering, for it shows that, by skillful designing and the choice of suitable ma-terial, a light motor can be built with all the refinements which are now usual all the refinements which are now usual-ly fitted to high-grade engines for motor-car work The spasmodic action of many aeroplanes at present in use is due largely to the fact that their engines

are unreliable

The new Maxim aeroplane is mounted on wheels fitted with nest shock absorbers. Regarding the machine as a whole, its clean lines and uncommon aswhole, its clean lines and uncommon as-pect are the most striking features. There is a noteworthy absence of the complication of stays, guy wires and framework, which on many biplanes cause so much head resistance. The grouping of the various organs has been very skillfully done, and as far as ocen very skillrolly done, and as far has possible those paris which set up most resistance are set in the same lines, one behind the other, thus minimizing wind resistance in effect the whole machine bears evidence of remarkable originality, bath in its except form and for its machine in the property of the property both in its general form and in its main details. Sir Hiram does not yet pro-pose to test it in free flight, as he has built an apparatus like that designed by the late Capt Ferber, whereby the ma-chine can circle in a captive state around a steel mast. When so many other ma-chines, however, are experimented with in free flight by aviators of small ex-perience, the Maxim method may not seem altogether necessary, although with a striking new type of machine it is undoubtedly a very sure course of pro-

## THE OLIVE BRIDGE DAW

the during land and 252.

cubic variate from page 252.

cubic variate from excavation and 7,200,
000 cubic yards of embankment and refilling. The plant of the contractor at
the Olive Bridge dam consists of four
cableways, about 95 feet in height, which extend across the valley above the dam with a clear span of 1,530 feet. The crushing plant, with a capacity of 200 tons of crushed stone per hour, and the concrete mixing plant are located con veniently to the work, the material being brought below the cableways, by which it is deposited as desired along structure Work was begun in the fall of 1907, and at the present time about 25 per cent of it has been completed

per cent of it mass been completed.
The total length of the aqueduct
(which is 17½ feet wide by 17 feet in
height) from the Ashokan reservoir to
the city line is 92½ miles, and its cost
will be about \$45,000,000. To render the work perfectly secure and perman ent, wherever the aqueduct encounters streams or rivers of any magnitude it a carried beneath them either by deep is carried beneath them either by deep pressure tunnels, or by sized and con-crete pipes. The most notable pressure tunnel will be that below the Hudson River In some respects this is the most interesting feature of the work, and we are informed by Mr Alfred D. and we are informed by ar Alived D Filing, Department Engineer of the Board of Water Supply, that the borings have revealed at great depth a granite rock emissionly suited to carry this great and important conduit. In addition to a vertical boring made from a barge at the center of the river, which has reached a depth of 708 feet, two diagonal borings have been made one from either shore of the river That from the east snore of the river runs from the east orn shore descends at an angle of 44 degrees for a distance of 1907 feet, where it has reached a point 70 feet where it has reached point 70 feet from the coater of the river From the form the coater of the river From the first of the river From the in degrees, another boring has been driven for 1760 feet, which is now with in 130 feet of the center of the river The vertical shafts are now being such on either shore; they will be carried down to a depth of 1,000 feet below mean high-water level of the Hudoma River at (Outcombided on page 300.)

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this point At that depth they will be
connected by a horisontal tunnel. The
aqueduct passes through the mountains, addeduct passes varough the mountains, and reaches the westerly shore of the Hudson River at an elevation of '460 feet above tide level, and here vertical and horizontal shafts will connect with the 1,200-foot deep shaft at the imm ate edge of the river, making a total depth of 1,600 feet from the flow line to the lowest level of the siphon. It is gratifying to realize that after the doubts and anxieties regarding the guo-

logical conditions affecting this work, its construction in solid granite has been

assured it should be mentioned that the whole siphon will be liued through

out with concrete out with contrete

At Kensico there is being built an
auxiliary storage reservoir of about 40
billion gallons ultimate capacity, of
which about 20 billion gallons will be available at flow line level. The elevation available at flow line level. The elevation of the discharge will be 356 feet above mean tide. At Searsdale 4 miles south of Knsice, will be a large fittration plant, and at Hillview, 6 miles to the south of this will be built another storage reservoir with a capacity of 390 million gal. lons, the discharge being 295 feet above

The Kensico dam, which will be built scross the valley of the Bronx, will be a masonry structure 290 feet high and

1830 feet long From the Hillylew reservoir water will be carried to the several boroughs of the city in a pressure tunnel excavated deep down in the rock beneath the boroughs of Broux and Manhattan and under the Harlem and East Rivers, to s point in the heart of Brooklyn, who will be brought to the surface and continued in metal pipes, one branch lead ing north to the borough of Queens, and the other passing below the Narrows to Richmond at a point where the width is about 10,000 feet. The construction of this tunnel will confer the inestimable this tunnel will confer the inestinable advantage that even at the lower end of Manhatian the water will rise to a height of 250 feet above sea level, or say to about the top of a 20-story building. The total cost of the work from and including Ashoxan dam to the city line, all of which is now under contract is

\$69,094,870, and of this amount work to the value of \$10,000,000 has been com pleted The total cost of the whole scheme when all the watersheds have been developed, will be \$163,000,000

# IONIZATION OF AIR

IONIEATION OF AIR
(Confinue if your page 245)
The metal becoming tharged gives a
greatly enlarged shadow
The ions travel in a strong electric
field at the rate of several thousand feet per second, and it is not the air which per second, and it is not the air want conveys the charge, although it is dragged along by the ions in the same manner as it is by a jet of water. This can be demonstrated very easily by directing a blast of air at right angles to the path of the ions. Scarcely any deflecin Fig 7 is shown the image of an eb-onite rod and a glass tube produced in the manner already described. The next the manner aiready goacribed. The next illustration represents the same objects with a strong blast of air thrown athwart the rourse of the lons. The effect of the blast is only shown issuing from the tube-just beneath the rod. Otherwise the re-sult as oxacily the same as if there were

The experiments may be varied within a very wide limit, and an interesting variation is to use, instead of the shoults thest, a plate of metal well insulated and connected to the other pole of the elseconnected to the other pole of the sloc-trical machine, instract of exarching the pole as previously déscribed. On aboset of metal lay a piece of paper, and upon this sprinkle filings preferably as mixture of magnesium and based tros oxide. Between the sheet and the dis-fers, such as the cross, and when the (Concluded on, pages BEL)



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(Concluded from page 200) ectrical machine is set in action the filings will disappear from under the eb-onite cross, giving a well-defined image, as shown in Fig 9

In the early part of this article it was pointed out that the electric discharge would not pass through perforated zine under the circumstances there prevailing But it can be made to do so To bring about this result place a plate of metal connected to the second pole of the ma canne seneral rae countre speet in such as way as to bring it opposite the discharge polut A in Fig 12 Sprinkle the surface of the chonite sheet with the powdered red lead and sulphur, and in powdered red lead and sulphur, and in terpose an earth d short of perforated zine or a metallic sleve between the dis-charge point and the chonite. When the electrical machine is set in action a per feetly defined image of the perforations of the zinc obstacle will be obtained upor the ebonite sheet as shown in Fig II If the plate condenser with its connected sides of tinfoil, mentioned previously is used, the passage of the lons through used, the passage of the ions intolign the perforations may be ascertained by the sparks jumping across the narrow gap. The explanation is that under the conditions described the electric field extends uninterruptedly from the point of discharge to the insulated metallic plate, so that the perferated sheet is in a per

fectly neutral condition and scarcely in tercepts the ions. Several other striking and interesting methods of ionizing air can be carried out, such as by a flame white-hot met als, electric sparks, and so on One of the most impressive is that showing that ionization is produced by ultraviolet rays falling upon zinc if a plate of rays failing upon time. If a plate of clean lane connected to a gold leaf electroscope be negatively electrified and it measures to be upon the control of the clean lane leaf to be tween aim electrodes it is rapidly discharged If the charge in positive, the phenomenon will not be produced, the experiment will also serve to show that these negative tous follow the discharged III also serve to show that these negative tous follow the Court of the capture illustration, Fig 13 shows how to carry out this experiment. The tinfoil backing of the ebonite plate is connected to the positive pole of the mashine Opposite this plate and parallel therewith is placed a sheet of zinc, connected to the negative pole of the machine leaving a clear width of about three inches between the two plates. The zinc plate is illuminated by the ultra violet light from the zinc are light for about a minute Under these circumstances the lines of force run perpendicularly between the two plates, and if any design is painted In varnish upon the zin plate, the emis-sion of ions from that portion of the sine will be arrested and a reverse in age of the design will be obtained on the ebonite plate when subsequently dusted with the powdered red lead and

The experiments of Sainte-Claire De ville and Caron apparently proved that the Oriental sapphire owes its beautiful color to the presence of a minute quantity of chromium in a state of oxidation lower than that which corresponds to the ses quiexide. It has not hitherto been found possible to reproduce the blue color with the aid of chromic oxide and reducing agents, nor yet to obtain by fusion in the oxyhydrogen fiame, artificial sapphire colored by traces of oxide of iron If however, a small quantity of titanic acid is added together with the oxide of iron, the reduction of the acid to titanium ox the reduction of the acid to illanium ox ide takes place to such an extent that the mass fuses and assumes the fine blue color of the sapphire This result has been obtained by Verneuil, who is of the peen obtained by verneuli, who is of tim-opinion that in addition to sapphire col-ored by oxide of chromium there is an other variety which owe its color to ox idea of iron and titanium. We have seen specimens of those artificial sapphires and to as they seem as beautiful as those of



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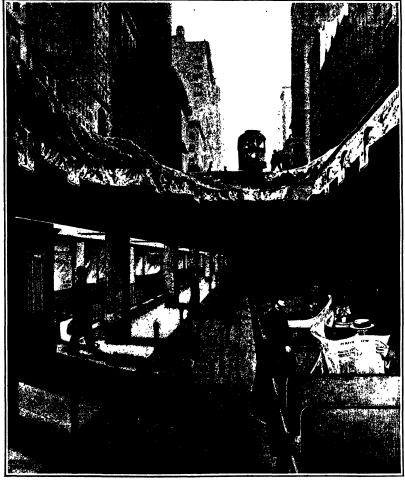






# A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CIL.-No. 13. | NEW YORK, MARCH 26, 1910 | 10 CPNTS A COPN. STORY OF ST



The method of transportation by moving platform above an earry, according to the Public Service Commission, 78,500 people per hour at 12 miles per hour. Tp to distances of 4 miles this is an fast an travel by the present combined express and local service. The express trains can carry 36,000 and the local trains 22,500 per hour. The successive platforms more at 3, 6, 9, and 12 miles per hour.

\*\*RAPD TRAINITY BY BRIT ON PERSON—[See page 257.]

## SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY MARCH 26th, 1916

The heliton is always also for exercise for examination illustrated articles of subsets of this is interest. If the photographs are slorgy, the articles should not the facts intrinsit on the contributions will receive special attention. Accepted affects will be paid for at regular space rates

THE PRESERVATION OF THE CITY HALL PARK. T is a positive misfortune that the lack of a co-ordinated plan coupled with the astounding rapidity with which the city has been built up. to say nothing of a total want of foresight on the part of the municipal authorities should have robbed the metropolis of the New World of the oppor tunity to present those aggregations of magnificent municipal hutidings, grouped about spacious and care-fully laid-out plazas and public squares, which are one of the glories of the great cities of the Old World Buch public spaces as we possess have been gradually encroschod upon and their intended vistas have beer closed and too often positively disfigured, by build-ings of no architectural heavy which have been run up apparently without any appreciation and extainly with a total disregard of the architectural oppor

tunities thus presented and so ruthlessly thrown away.

Perhaps the best known of our public squares is City Hall Park which early in the last century, was beautified by the erection of that gem of municipal architecture the City Hall a building which even at are incentive in City Init a unitality when even at this late day maintains its position untailinged as the most perfect piece of work of its kind in New York if not in the whole of the Inited States. For the greater part of a century this chashe building was pis-tically the sole occupant of the park and, standing in the midst of its green haves and surr though not obscured by an adequate growth of tim ber, this beautiful structure long remained as the dominating feature of what is certainly the most in teresting and in some respects the most beautiful of our smaller city parks

The first descration of this spot occurred when the Federal government erected at the apox of the tri angle that unsightly pile which for several decades done duty as the General Post Office, a building which not only entirely shuts out the charming view of (By Hall and the Park which was formerly obtain able from Broadway but constitutes in likelf a monu ment to the total lack of refinement which marked the public architecture of the day in which it was built.

And now it is proposed not only to further encroach apon the aiready restricted area of the park by ing thereon a County Court House of colossal dimen sions but it is intended, if you please to place this siructure immediately behind the City Hall, whose just proportions and delicate beauty will be entirely dwarfed and ruined by the towering and widely over inpping façade of the building Although it may be a palliation it is certainly not a justification of Mayor Gaynor and the other city officials who favor this course, to state that they do so unwillingly and after a sincere endeavor to secure some other suitable site. For there is a possible though very costly, escape from the dilemma by means of the alternative in which originated with the architects of this city and is receiving the indorsement of the leading artis tic municipal improvement, and historical societie to say nothing of a thoroughly unanimous public pres cieties This proposal is that the city purchase the two blocks lying immediately to the north of the City Hall and place the m w Court House upon the land so secured the various departments being housed in the office and other buildings now covering this land until such time as the new Court House is ready for occu-pancy. As the needs of the city demand it and the funds become available the land so acquired would be covered with other municipal buildings of a monumen tal character, and ultimately this group of buildings, and the City Hall Park with the present historic structure would form an important center with landscape and architectural effects of dignity and beauty that would be commensurate with the importance of a city which is destined ultimately to become in size wealth, and importance the leading city of the world,

# Scientific American

In giving our hearty indersement to this proposal, we are not unmindful of the fact that New York city has now in contemplation public works on an enormous scale involving the expenditure of vast sums of mous scale involving the expenditure of vast sums of money But we also realize that in municipal as in other affairs, conditions may occasionally arise in which sacrifice on the part of the present generation, large as it may appear at the time, may come to be regarded by posterity as but a small price to pay for the lasting benefits conferred.

The present crisis surely presents an opportunity of

this very character

### THE MEYER HAVAL RECOGNISATION TO HAVE A PAIR TRIAL

N view of the diversity of opinion which developed at the hearing of the House Naval Committee that body followed, we think, the wisest course in failing to recommend any legislative action until Secretary Meyers plan has been in operation for a summent length of time to prove the extent of its practical utility. As to the wisdom of some of the changes which the Secretary has made, there can be no possible difference of opin-ion. The institution of a separate and independent Bureau of Accounting is one of the best reforms that have been introduced into the navy for many a decade, and already at the Boston yard, where it has been for a considerable time in operation, the system has

shown very satisfactory results
We are also heartily in symps posal of the Secretary to dispose by sale of those of our older vessels, which are so deficient in certain necessary qualifications of a modern warship as to render the expenditure of a heavy sum of money upon them for repairs and reconstruction a very upon them for repairs and reconstruction a very doubtful policy. A few years ago England struck off the list and put up at auction over one hundred of her waiships, and there is no question that her uavy was the better for this very drastic pruning out of and decayed material

Although the proposal to squarate the work of the navy yard under the bread division of hall and terial is bused upon logical grounds, and would ulti terms is based upon logical groupus, and would immetely prove to have working advantages of a practical character, we think that the proposal to separate the work is somewhat premature and this for the reason that we have not ro-day among the negineering corps, a body of men of sufficient shop experience to qualify them for that oversight of the shops which is contemplated in Secretary Meyers shops which is contemputed in Secretary aspers a plan If the institution of a separate department of machinery includes as an indispensable corollary the training of a certain number of the naval engi-neers for primarint short daily as managers of the norts for prinarins more using an insumers of sitems engineering shops of the navy said the success of the plan would seem more certain. In any case, we believe that until such a trained body is available it would be advisable to continue both the steam engineering and construction shops under the management of the naval constructors

Now that the Meyer plan is assured of a lengthy period of trial the country may rest assured that the whole of the naval service affected by the changes will co-operate in a loyal endeavor to give the new plan such a perfectly fair trial as will serve to deter thal utility Therefo re we greatly regr to see that a prominent New York daily paper has so to see that a prominent New York daily paper has so far forgotten the dignity which attaches to its well deserved reputation, as to indulge in a bitter per-sonal attack on certain naval officers who have re-cently testified before the House Naval Committee, and that our contemporary has gone so far as to in-sinuate that because some of these officers were not in sympathy with certain features of Mr Meyers plan aly proper course left for them to p tender their resignations

It is unjust and misleading for that journal to omit to state that these officers had no choice in the matter of giving testimony before the House Naval Committee, when once they had been summ fore that body, and that it was the wish of the Secretary that they should reply to the questions of the committee unhampered by any consideration of whether their views were or were not in harmony with his own

So far from their frank express ment with certain phases of the Secretary's plan showing in any sense a spirit of insubordination, we rather take it to be evidence of a true moral cour-age which places the highest interests of the navy above any consideration of a purely personal char

Therefore to insinuate as does the New York Sun Therefore to linature as done to never tore until the navy that from these and other gentlemen in the navy who may happen to disagree with certain parts of the Secretary's plan, it would be impossible to secure proper co-operation during the coming months of trial, is to bettuy a complete ignorance of that high professional spirit which pervades the United States Naval Service, and is nowhere more conspicuous than in that hard working and little appreciated body of officers, the Naval Constructors.

### THE SCOTTISH SHIP CANAL.

HE British government having reviewed the various projects for a ship canal through Scotland, whereby the Forth and the Clyde can be connected, have decided that so far as naval requirements are concerned, the most favor-able route is that through Lochs Lomond and Long, or as it is generally called, the "Low Level Route Such a canal the government states would unque size a canal the government states would unques-tionably possess some strategical value, and as they would financially assist such a scheme, the promot-ers of the enterprise are urged to push the matter forward in commercial interests. The government, however, stipulates that the canal shall have a floor width of 148 feet, a depth of water of 35 feet, and locks 350 feet by 131 depth of water of 35 feet, and locks 860 feet long by 110 feet wide at the entrance, with a depth on the sill of 36 feet.

A see level canal was found to be impossible, for although the mean level of the sea is practically the same on the Clyde and the Forth, the level at high water is not, so that a sea level canal would postarp tidal currents which would involve serious in navigation

According to the designs which have already been prepared, the entrance to the canal from the North Sea would be a little distance north of Grangemouth. striking inland in a northwesterly direction, akirt-ing Stirling on the south and running into the Forth valley which does not attain a higher elevation than 30 to 50 feet above sea level, then passing through the haunch of Ben Lomond into the valley of En-This cut would be the heaviest on the whole route, the ridge attaining a maximum helpid of 260 feet above sea level But it is short Entering Loch Lomond, the waters of which are deep enough for the largest vessels asions, the loch is followed for 13 miles to Tarbet where mother cut is made through the neck of land, 1% miles wide separating Loch the neck of land, 1% miles wide separating Loch Lounoud from Loch Long The latter would be en-tered at Arrochar and this loch, which has a very great depth of water, is followed until the Firth of Clyde is reached opposite the Cloch Lighthouse The locks would be placed at either and of the canal that on the Clyde to lift the vessel to the level of the water in Loch Londond which is 22 feet above the mean level of the sea and the other at Arrochar to regain the sea level in Loch Long

The total length of such a canal would be 61 nautical miles of which 30 miles would be in canal and the other 21 miles in the open waters of Loch Lomond and Lock Long The deepest cuts would one of 191 feet near Stirling another of 285 feet the head of the Foth valley, and one of 142 test tetween Tarbet and Arrochar These cuts though The vessels will have to be deep are very short d at the F Forth end of the caust 13 feet at high water and 31 feet at low water, at Arrochar the lift would be 17 and 27 feet respectively in addition a regulating lock would be formed at the head of the Endrick valley to be used when Loch Lomond is in high flood.

high flood. Further advantages of this route are the avoid-ance of river deviations only comparatively small brooks being encountered, which could be easily syphoned across the canal Only one deviation would be necessary that of the Endrick which after all is only a stream. Again, the minimum of interference with the railroads will be offered. No swing bridges will be necessary and it will be possible for ves-to proceed without shortening their masts sharpest curve will have a radius of two miles. The construction of the canal will entail the excavation of 170 000,000 cubic yards of material, and its cost, ot the Admiralty requirements, would approxi

mate \$120,000,000 Work would occupy seven years Apart from its strategical value, the canal would have distinct attractions for commercial traffic. It will offer a shorter route between America and Europe, and will avoid the dangerous passage viz Europe, and will avoid the dangerous passage view the Peniland Prich The sextent of this "North About" traffic as it is called, including the coastal famile, is considerable, and the saving of from 150 to 500 miles in the sex journey of the transattantic research, according to the situation of the Bruropean port would be an important consideration. The sergets of this traffic which would use the causal is expected the sextent of the property of the sextent of the property o 10,724 805 tons per annum, and at an average rate of 77% conts per ton this would yield an annual reveaue of about 34,031,500, which after deducting 3300,000 as the annual cost of maintenance, etc would yield about 3 per cent on the capital for an Admiratiry cental. The achieves is being actively pushed forward, and so soon as some idea of what the government would be prepared to do financially is obtained, no difficulty will be experienced in securing the se mary financial support to construct the

# Scientific American

### AERONAUTICS.

BE. Ader, the Franchman said to have flown about 1,000 feet in 1897 with his steam-propalled monopiane, the "Avion," has recently been decorated with the red ribbon of the Legion of Honor His machine is said to have embodied the wing-warping principle since patented by the Wrights.

Proceedings have seen begun in France to invalidate the Wright point No. 454,186, of March 24, 1944, and the Wright point No. 454,186, of March 24, 1944, and the patent was not worked in France within there years, as must be done according to the statute. In searching for anticipations the France inverse have seen of the statute. In searching for anticipation point No. 828 of Mathew Wett Boulten, granted in 1858, which provides movable wing tipe or "allerous" for the puryose of transverse stability in 1876 Rth off Harte, another Englishman, took out a patent (No. 1469) for maintaining transverse stability by means of revolving wing tipe operated by a weight

The second annual combined aeronastic and motor boat abov opened in Olympia, Indone (England) on March 11th Besides numerous small models, forty of fifty seroplanes and halloons were shown In addition to the regular French models of Wright, Bliefrid, Farnan and Santos Dumont, a number of British built deplicates were shown by well-known firms. as the Humber Company, for example In addition to these there were a number of new acropiance built by English inventors Interest in avia tion is very strong in England at present, and several tion is very strong in England of the coming sum

In preparing for a re-hearing of his case on the 19th inst, Glenn Curtiss has experimented to see how much resistance can be interposed at the ends of the planes of his biniane without causing it to sworve d small vertical fins 1x2 feet in size, and for that these could be set at right angles to the line of flight for a few seconds without causing the aero plane to swerve from a straight path and without moving the vertical rudder. As the resistance of the balancing planes which Curties uses is far less than obtained in the manner just des be no turning tendency produced by them, and hence no use of the vertical rudder in conjunction with them Mr Curiles has also flown with the vertical rudder tied and with it loose, showing that a movement of this rudder is not required. We also learn that the Autoinette monoplane has been flown with the vertical rudder left off With these practical nstrations of flight without the use of Wrights' natented combination, there seems to be ittle doubt that any infringement suits they may institute will be successfully defended

On Saturday March 12th, Aviator Louis Paulban ort straight line flight of 500 to 600 t at the Jamsica race track. The strong wind of 25 miles an hour velocity, and the few spectators were the principal reasons. On Sunday, however, usund people journeyed to the track, mar of them in automobiles, and despite a wind nearly as strong as that of the day before they were not dis-appointed About 4 45 P M Paulhan started against the wind, which was blowing directly acro His machine rose after a run of some 75 feet and traveled diagonally across the track while ascer-ing constantly at an angle of 15 to 20 degrees to a height of 300 feet above the trees on the opposite side of the track, then, turning around, it sped back with the wind, passed over the grand stand and, making a sharp turn, swooped suddenly th at the very point at which it starte utes before Paulhan's was the most thrilling exhibition of flight ever seen near New York, and it is unfortunate that a dispute with his manager has stopped any further demonstrations

On March is and 3nd Mr Heavy Parman made of some record flights with passengers with a new biplane. His machine was originally built for the Rheims meeting last August, but it did not fly then owing to an accident. Despite its small size and surface, it showed excellent lifting power and stability appears in 13 or 16 feet showers, besides having a large section cut sway in the center to accommodate the plane is 13 or 16 feet showers, besides having a large section cut sway in the center to accommodate the center out sway in the center to accommodate out sway in the center to accommodate out a sway in the center to accommodate out a sway in the center to accommodate out a extended of the upper plane only, and the call consists of but a single borisontal surface between the two halves of the upper plane only in the call consists of the upper plane only in the call consists of the vertical runder. The machine is mounted upon combined runners and skids and fitted with a lot H P Goome revolving cylinder motor. On the laft fine. Mr Parman made a flight of over its ginutes with Mim Parack and another passenger, thuy besting his three-person record of 10 35 made at Reharmy on August 28th, 100 The following day he again flew with two passengers and recentions alort fill and the content of the conten

### ELECTRICITY.

In September of least year the Boston and Mains Railroad established a telephone train dispatching system on the line between Boston and Flichburg. Mass This system proved so satisfactory that the railroad, is now about to equip two new divisions with telephone these the divisions consists of a similar line, from Concret to Wooderlin, N. H. and River Junicion. Vi.

In a lacture before the Engineering Society at Birmingham, Sir Oliver Lodge discussed the question of protection from lightning. He stated that the problem consisted in finding the best method of dissipating the enormous energy of the flash, but that twas now that to get rif of the energy too quickly A thin from wire is considered the best lightning conductor from the electrical point of view, but it is conducted to the electrical point of view, but it is not applied to the conductor of the electrical point of view, but it is uning this in the conductor of the conductor of the electrical points of the electrical p

Experiments made with ultra violet light app that it is more effective for sterilizing liquids than osone The ultra-violet light is produced by means of mercury vapor lamps quartz tubes being used instead by glass tubes which are placed in di rect contact with the water to be purified. A French investigator, M. Victor Henri, has found that th bactericidal action varies greatly with the distance of the lamp from the bacteria. With a Cooper Hewitt lamp of 110 volts an exposure of 300 seconds at a distance of 60 centimeters was required in order to kill the bacilius coli At a distance of 40 centimet ers an exposure of 180 seconds was sufficient, and at 20 centimeters 20 seconds. The temperature appeared to have little if any, effect for the microb were destroyed even when the liquid which contained In treating opaque liquids as milk it was necessary to spread the liquid out in a thin layer For milk the maximum thickness of Another investigator produces the ultra violet light by means of electric discharges in a rare re of carbon monoxide, carbo aulphureted hydrogen, or aulphurous acid

An interesting description of the rural telephone lines in the Ozarks was published in a recent humber of the Electrical Review and Western Electrician Every farmer in this region, no matter how poor has a telephone. The telephone lines have been installed by amateurs and every variety of teleph is used on them Owing to fear of lightning the ction from the pole line to the house wire is by bending the ends of the wires and hooking together. When a thunder storm approaches them together this connection is unbooked and it frequently hap pens that the owner forgets to re-establish connec tion with the main line after the storm. The lines are all grounded, making it very difficult for one party to call another Fifty telep considered a light load. The line ones to a line is The lines are supported on auch poles as can be easily obtained, which are sel dom sunk to a sufficient depth in the ground to prevent them from leaning at all angles. Trees are also used to support the lines and the branch are seldom cut away to clear the wires. However, the scribers appear to be satisfied if only their line The subscribers usually combine to but up a switchboard in the nearest town and pay some

A very interesting method of electropiating has sen developed in England. The metal that is to be deposited is mixed in nowdered form with other suband rub it on the surface that is to be plated other ingredients are an electro-positive metal, such as zinc or magnesium, an inert substance such as chalk, and a sait which when wet serves as an electrolyte The following description of the process is given by the author 'The electro-positive metal constitutes the anode and the object (reated the cathode, and as 'Gaivanit contains a quantity of finely powdered electro-positive metal it makes innumerable contacts with the cathode surface and acts as so many minute anodes. These innumerable minute anodes graduelly dissolve, and in dissolving set up in the liquid little local circulations of electric current The circuits are so excessively amail, so exceedingly near together, and so numerous that they cannot be sensrately obed, and the surface of the metal becomes seat of innumerable concomitant voltaic and electrolytic actions. Thus the potential or stored up energy of the elementary substances in the powder is converted into electric current, and as these currents leave the liquid they throw down from the metallic sait in solution a thick film on the cathode, and it plated over with a deposit

### SCIENCE

Prof. Lowell announces that he has discovered a new canal a thousand miles in length on Mars The canal developed between May and September last

It is stated that many of the library newspapers, printed twenty years ago are disintegrating because our modern wood pulp paper is not perman

The collection of Indian contunes weapons and utcasils brought together by E W Lenders of Phila delphia and valued at \$40,000, has been bought by J Pierpont Morgan and given to the American Museum of Natural History.

The astronomical clock at Hampton Court Palacehas been removed for repair and repaining for the first time for nearly thirty years. The clock, which was the first of its kind in England was made for Heary VIII in 1800. In 1800 it was brought from a shed at the balace where it had lain for nearly half a century, and by order of the Office of Works was re-erted in the position which it has since or capiled in the contrayed of the palace.

This count discovered by Daniel in December is not the same as one discovered in 1887, for which a period of about forty two years had been found. Than left counted has been found to belong to the Jupiter family of counted having a period of about six and a half years. There are now over thirty of these and four or five of them pass through peribelion every year, but they are in many cases so faint as to elude observation altogether.

W W Cobleats has discovered that one of the functioning of the imprehension of the milky shuld which the framework interesting the milky shuld which the first interesting the milk shuld which the first interesting the interesting them is it as a superior except the milk as a function of the function of the milk as a function of the milk in which have lengths are measured as a function of the milk in which have lengths are measured to the milk in which have lengths are measured to the milk in which have lengths are measured to the milk in the milk in which have firstly which the firstly white a function of the milk in the milk in the milk in a post time and from \$10\theta\_{p}\$ to \$70\theta\_{p}\$. Hence the two spectra are mutually combinementary.

In the sorthern part of Archangel, which is the most northerly government of European Russia a farm to the breeding of Kamecharks ofters blue focces, sables, martens, and other valuable far bearing animals is being established by German capitalist. The soil and illuster of this district are exactly sailed to the animals and the annual result charge is only about 5 cents per acre, so that the centure appears very promisting at five glainer in the other shade a large initial outsity is required. The farm which has cost \$67.000, but the bury configuration of the control of

P Soddy finds that the growth of raidium proceeds recording to the source of the time. On the assumption that no other intermediate bodies intervent the period of the direct parent of raidium is 17500 years. The amount of raidium present in the last prepared notition is less than that to be expected, this suggests the existence of at least one new product. Urnaisan it is concluded that this would not appreciably after it is concluded that this would not appreciably after the production of raidium according to the square of the time over the priod other protons have been made, the time over the priod other protons have been made, the proton observations have been made of the average life of the parent of raidium according to the Rutherford formula.

A German bird fancker has made a series of experi ments for the purpose of determining the vitality of eggs in different stages of incubation. On the fifth day of incubation five conary birds a ggs were inken from the next, marked with numbers and replaced in the next, one by one at half hour intervals. This ent was repeated ten times with as many clutches of eggs. As a rule the first three eggs replaced batched normally and the two others failed to batch. Hence it may be inferred that the average longevity of a canary bird's cags taken from the next on the fifth day of incubation is 15, hours same way the longevity was found to increase to 2 or 2½ hours on the seventh day and 3½ to 4 hours on the ninth day of incubation—It was discovered by accident that eggs in a very advanced stage of incu bation can endure very much longer periods of re moval from the nest. Two eggs, purchased as picy er's eggs, in the course of an excursion, were si er's eggs, in the course of an excursion, were accessed in a basket, brought home and forgotten. On the evening of the following day a faint "peep 'recalled the existence of the eggs and it was found that a young suipe had issued from one of them. The secoon made its appearance but lived only an hour Hence it appears that the vitality of partly hatched eggs depends on the size of the bird as well as on the stage of incubation.

# An Account of a Trip in the Largest Balloon Ever Constructed

A BALLOON TRIP OF FORTY YEARS AGO.

It is doubtful whether the sensation of travelling in an airship has ever been better described than was done forty nine years ago inst Jun by Garrik Mailory and published in the Philadelphia Inquirer, June 38th 18th 6 fatr a voyage in the largest airship that had ever been constructed up to that time Mr Millory was a gentlim and education and fine

Mr Mallory was a genil man of education and fine descriptive tained and intercommanded a brigade of savairy during the civil war. Prof T S C Lowe, the aromati in charge has a distinguished civil war record as an aerial secul. He is constructing a great moistr a sirvily in his bosse city, Pasadena, Cal Hro is Mallory a secount, somewhat abbreviated "The ascent of Mr Lowes mammoth strainly on

The sacent of Mr Lowe's manimoth sirable on Thursday last was by no means an ordinary occasion Sol-disent scientific aeronauts had in treatuses and speeches positively demonstrated that it could not finant Accordingly, when on the ground, we

with beset with gratuitions advice from self-constituted professors and aimosphic voyagers to the offset that it was madness to risk the untried experiment, and as to our friends we were ridiculed, threatened, eagloid, brited, and wopt over by turns

"So we held a council of war with ourselves in a temphod rool reason and positively could not see why as increase of especially in a balloon must necessarily diminish its efficiency, or that a greater range in the amount of gas to be evolved on the occasion, and in the number of sand bags to be retained or thrown away according to the object of ascent or descent, stoud destroy control over the element to be navi-

"The few mont ropes are held by atrong arms, the enterprising workman who seems to desire an accent on the edge of the basket is induced to set down and put a bag of anal in his place, the other two gentlemen who determine at the olevanth hour to acquire serial honors scramble in when the swyling has begun, the last dying speech and confession has been made, all lated bying speech and confession has been made, all because the series of the series of the series of the bowever, in the alightest degree. There is no motion perceptible, and we conselves are outlively stationary Bosschilar to be sure is the matter with the field it has dropped Perhaps that is the reason why the cowed down below there is matting such a noise. They



LOWE'S DIRIGIBLE BALLOON.

are frightened, most probably To be sure, they have some reason. For it is a rather alarming occurrence for the soil earth to fall down in that way, especially when all nature is so caim, and the sun shines so happily, and our car is so nice and fixed So we feel badly about our unfortunate fallow beings who are momentarity becoming smaller. Suddon't, a villiant idea

seizes us that we have actually begun the great ascent, and we forthwith begin to wave the flags and hurn's hand jump No, we don't jump, for there isn't room, but we would it we could. The mites down below give cheer after cheer responsive, and run futilely in our course, and we fly away.

our course, and we sy away.

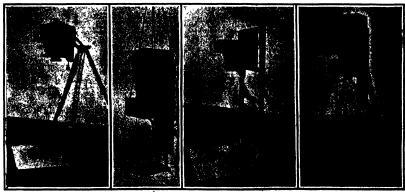
"Although nothing could have been easier than to have risen immediately to a great height, yet as the lower breese was northerly and light, we purposely remained in it, as thereby a deliberate view of the city mained in it, as thereby a deliberate view of the city. and its environs was presented that could not be hoped for once in a thousand times. We had precisely the day, the hour, the current, and, above all, the balloon sented that could not be hoped calmly on, silent, and ravished with extrasy At the altitude of three thousand feet we look down fondly on Gray's Ferry, Darby, and the park, somes of our equestrian pleasures, and then turn to the sparse houses of somi rural Moyamensing, picturesquely isleted in green lakes and foliage. Next we glide on over the great city, seeming to the asleep in that soft summer evening, with never a breath to disturb its happy rest, save the vague murmur of life which s upward toward us, like the distant hum of invisible apware toward us, like the distant num or invanise insects. We are higher now, and to the naked eye vast buildings like the Continental are distinguished otherly by their known position, but as we pass along, the streets radiato on all sides with mathematical exactness, bordered with faint green lines of foliage. The public squares are patches of verdant enamel, and the spires point up at us with the beams of the sun shining from their whiteness until they only can son summy root to the hear-frost appearing on a window in winter Far away Girard College is discorred in the distance as a nathlil of marble dust, and Fairmount is found in a fairy toadstool, with the Schuylkill curving close to it like a sliver thread dropped, perhaps, from the robes of Titania herself But it is perfectly in vain to attempt any description of this most exquisite scene, which naught but the colors of the most gifted could pretend to convey to any who have not gitted could pretent to convey to any sun have not beheld it Indeed, it was all to us but as seeming picture seen in an enraptured vision. There was no reality about it. We were real, and the car, but every(Continued on page 360)

# VERTICAL PHOTOGRAPHY

BY CHARLES MONROE MANSFIELD

In recording scientific material, whether plants or their fruits, or any peruliar material of which a record in picture is valuable, the exact size is slways desirable. Various apparatus have been constructed to support the camera and hold its subjects, but the real servet lies in the focus of the lens. Any subject placed twice the focal length of the lens from the iens, and the iens twice its focal length from the focal plane, will give a picture natural in size For example, a blue-luch focus lens placed eighteen linches from the subject and the focal plane the same distance from the lens will give a natural size image in focus on the ground glass without further adjusting the sames.

Nearly all actual size work is done vertically. This gives the operator the privilege of maniputating his funder ground during the exposure without interfering with the subject. The object to be photographed in smallly pilect on a glass support, which may be either plain or ground, and the back or under (Conciledon on page 287)



Just an ordinary camera and tilting tripod top. Th legs of the tripod may be aljusted to give the custom the nected height. The glass may be supported by four curks or a wooden frame as shown in the

The opposite cast revolve the active This is a very simple stand for varieties photography. The This transport may be exposent. This can every simple standard per departure players in the plane is the

# AN INTERNAL COMBUSTION WATER PUMP

THE INGENIOUS INVENTION OF H. A. HUMPHREY

Wifespread interest has been aroused in European engineering circles in a new type of pump that has been evolved by a well-known English engineer, Mr

H. A. Humphrey, M. Inst, C. E. It is hased upon an an tirely new principle, and is a revolution-ary departure from existing practice, the novelty of the design compelling as much attention as

The pump is mental principle of internal explosion, but does away with ing parts of a gas engine, such as the piston, connecting rod, crankshaft, fly wheel, two-to-one moving parts what ever except the sim-





mushroom INTERNAL COMBUSTION WATER

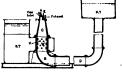
and close automati-cally, due to pressure changes, and the use of a fiy-wheel is not necessary because a column of water, forming part of the water pumped, acts as a recipro-

cating flywheel. The water column, which also acts cating nywheels are water commin, which allow alone as a piston, has four unequal strokes, such as theory requires when expansion is carried to atmospheric pressure. These strokes comprise long strokes during embustion and expansion as well as during exhaus a shorter stroke during suction, and a still shorter stroke during compression. There is no valve across the discharge pipe at any point, so that the water has a perfectly free passage from the explosion chamber to the high level tank.

The explosive mixture of gas and air is ignited, as in the ordinary internal-combustion engine, and in contact with one end of a column of water which ful contact with one end of a column of water which ful fills the dual function of piston and flywheel and moves so as to draw in a fresh combustible charge, to compress this charge previous to explosion, to permit expansion to be carried to atmospheric pre-sure, and finally to exhaust the products of combus-All these movements are brought about and con trolled by changes in the momentum, which occur naturally in the column of water itself In order to explain the cycle of operations in a

the simplest type, a reference to the accompump o the simplest type, a produced. The pump panying diagram will be found useful. The pump to built up from three main castings. There parying diagram will be found useful. The pump proper is built up from three main castings. There is the combustion chamber  $\theta$ , the water vaire chamber  $\theta$ , and the bead  $\theta$ , which connects the pump to the discharge pipe D, leading to the clowards tank  $\theta$  TThe suction task  $\theta$  T is extended to ambrave the valve-box chamber, as shown, so that there is free access of water to all the water valves  $\theta$  T The last access of water to all the water valves V The last are plain mushroom valves, opening inward, and held on their scating by light springs In the top of the combustion chamber is an inlet valve A, as well as an exhaust valve K Arranged between these two valves is a simple interlocking device, so that when valves A has opened and closed it locks itself shut, and releases valve E, and when valve E has opened and sequently, each time suction occurs in the chamber e valves open in turn.

For the purpose of demonstration, suppose a gaseous charge is compressed in the top of the combustion chamber C, and is ignited in the usual manner by the sparking plug, which projects through the top or head of the combustion chamber. All the All the valve are shut at the instant the charge is exploded, and



SECTIONAL VIEW OF INTERNAL COMBUSTION PUMP.

the increase in pressure resulting from the expand gases forces the water downward in the pump, and sets the whole column of water in the bend B and dis-charge pipe D in motion The column of water attains kinetic energy while work is being done upon it by the expanding gases, so that when those gases finally expand to atmospheric pressure, the column of water may be moving, say, 6 feet per second. The motion

# RAPID TRANSIT BY BELT CONVEYOR

### A PROPOSED AMPLIFICATION OF NEW YORK'S SUBWAY

The method of rapid transit by means of continuously moving endless platforms has never as yet re-ceived the attention which its unquestionable advantages deserve, for, within certain limits of speed, it possesses a capacity for carrying passengers which is possesses a capacity for carrying passengers when as so far beyond that of any existing system as to place it in a class by itself. That the system has not been put into practical application in the solution of those problems of congested city traffs for which it is so admirably adapted, can only be explained by the exadmirably adapted, can only be explained by the ex-treme novelty of the method employed, the inertia of that deep-rooted conservatiam, which, even in this atteity utilizaria mape, exerts such a powerful con-trolling influence on buman affairs. The construction and operation of the moving passenger platform is so simple, and its great carrying capacity is so obvi-

ous, that its advantages are readily perceived even by the layman who may have no particular mechanical aptitude or training, and it is certainly significant that the proposal to equip a sec-tion of the proposed New York Subway with a moving platform has received the informement of such men as Henry B. Seaman, the Chief Engineer of the Public Service Commission, and of Mr. L. B. Stillwell, the electrical engineer who was responsible for the electrical who was responsible for the electrical equipment of the Elevated Ralironds and the New York Subway system. Interest in the proposed moving plat-form has been recently revived by the recommendation of the Board of Estimate of this city that a moving plat-form be installed in a subway extendform be installed in a subway extending across Manhattan laiend from the flast to the Hudson Sitrey below Thirty-fourth Sitreet, and on the front page of the present lessue in a sectional limitaristics, which shows the subway said of the moving paintorn such as the subway said of the moving paintorn such as the subway said of the moving paintorn such as the subway said of the moving paintorn such subway subway

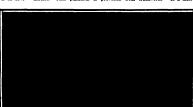
way and of the moving platform itself.

In those branches of our industries, for the economical operation of which it is absolutely necessary that material the conveyed from place to place at a maximum speed and with a minimum one, it has emailted there in one system of transportation which so perfectly fulfills these conditions as the but caveyor Particularly is this true where a great particularly in the true where a great bell of material, constitute of there are feel of difficult with a material constitute of these or less flashy difficult within such as coal, iron one, and when, the to be moved in great emantities with a stitle interests to the material of the material of

runtion as possible and without any manipulation by hand In this system, an endle it moves contin ously in a given direction, and facilities are provided for loading the material on the belt at any desired for loading the material on the belt at any desired point and for unleading it therefrom at any desired

point of delivery

The moving platform is no a huge best conveyor, in which the material to be conveyed consists of the teeming millions which consti veyed consists of the teening millions which constitute the passenger traffe of a great city, with pre-vision for loading the passengers at any point through-out the length of the platform and unloading the while the latter is in motion. The train consists of short jointed platforms, coupled together and form-ing an endless chain which is kept in continuous motion. This platform is provided with transverse motion. This platform is provided with transverse



View of the method of driving the platforms by means of stationary electric motors and differential rubber-tired wheels. RAPID TRANSIT BY BELT CONVEYOR.

seats, and if travels at a continuous uniform speed of trevier miles per hour. For transferring the pas-senger from the fixed station platforms to the seated platforms, there are introduced between them three narrow "loading platforms" which more at differen-tial speeds. The first of these adjoining the station that special, rule risk of trokes acquiring the state of platform moves at three miles per hour, the next at six, and the next at nine miles per hour. The passen gar who wheles to board the rule, faces the direc-tion in which it is moving, steps onto the three-mile-per-hour platform, and, creating the other two possitively, takes his seat. The suscess of the somlator or moving stairway, of whith many operation throughout the country, removes any doubt of passengers being able after a little practice to accommodate themselves to the speed of three miles an lator or moving stairway, of which many are now in hour involved in boarding the train

The advantages of the arrangement as summed up by the Chief Engineer of the Public Service Commis-

sion are as follows

1 A vastly increased capacity, and seats for all

There is no delay incurred by waiting for trains at stations, as the train is always there and co

stantly moving 3 Passengers may board or leave the train of any

int at will, and instead of placing stations of of a mile spart, as on the present Subway, they may

be placed at every cross street, or in-deed at any intermediate point, and the construction may take the form of a continuous arcade

In its general construction the tun nel would be similar to those built for the ordinary Subway traffic. It is proposed, however, to build an ader throughout its length, with store win ous promenades between them and the ous promenants between them and the barrier separating them from the Sub-way platforms. At each street cross-ing, and if it be desired at one or more points between them ticket booths and turnstiles will be installed an arrangement which would permi passengers to source the curs practice cally at any desired point throughout the length of the subway.

The arrangements for driving the platform by electrical power are as follows:

lows Extending longitudinally be-neath each platform is a pair of I-beams, the upper flanges of which are riveted to the

bottom of the platform, while the lower fianges serve to support the weight of the platform upon pairs of wheels, which are carried upon transverse shafts mounted at intervals of 2 feet 9 inches, upon concrete piers, as shown in the engraving Between cuch pair of longitudinal I beams is carried a pair of horizontal guide wheels which engage a guide rail that serves to keep the platform in proper alignment At every 76 feet, 10-horse-power motors are mounted on the floor of the subway, and are connected by a chain drive

## COMPENSED FACTS ABOUT HALLET'S COMET.

A few facts presented in a condensed form may possibly interest the readers of the Beystiet AMERI CAN who wish to follow the course of Halley's comet in the heaving during its press at annear

The last perhelion passage of fitted on November 16th 18th The present perhelion passage will occur on April 20th 19th The principle distance will be 0.057, and the aphtilon distance will be 0.057, and the aphtilon distance will be 0.5 th The contrictly is 99%, the longitude of according node is 57 deg 15 units the inclination of the orbit is (16th deg 12 unit 1 mil 1 deg 3 mil 1 mil 1 deg 4 mil 1 d

of Yorks, Observatory estimated the tail to be 140000 miles long. Just be force to be 1400000 miles long. Just be force will be also and after perihelion passage the tail will be at least that long, and probably longer. The comet is fast supreaching the perihelion policy, or point nearest the sun where, as we have said it is perihelion policy, or point nearest the sun where, as we have said it is perihelion due to arrive and the sun of the contract of the co

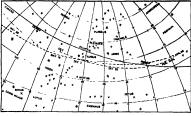
The cemet first creased the earths orbit about March 10th at a point orbit about March 10th at a point where the certh will arrive at the mid die of next Cecleer, but far above where the certh will be no to speak or it will be nome 10,0000 milus above the plane of the cellptic. In April the connext will emerge from be bind the sun, and will become visible to the naked over in the eastern sky

before nursies

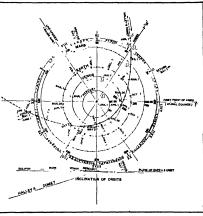
on April 20th, when the comet will swing around the sun, it will be 50 monotone to make the sun in twicely will be 26 miles a second. The sun is seen as the sun in twicely will be 26 miles a second. On May find the comet will tree and the sun in th

sky after sunset with a 15 deg or 20 deg splender After that it will speed away from the solar system. The last glimpse of it with the naked eye will be obtained probably at the end of June. It will not reappear for seventy five years Halley's comet is notworthy because it was the

Halley's comet is noteworthy because it was the first comet for which an orbit was plotted and a time table calculated It has a history more or less identi ned with the history of human thought and civilisation. The superstitions dread with which it was reported in medieval and ancient times swayed many a monarch. It was instrumental in forming the policies of Louis le Debonnairo in 837 it blazed in the



THE APPARENT PATH OF HALLEY'S COMET THROUGH THE REAVENS.



HALLEY'S COMET AND THE BARTH.

Hors on the orbits show positions of planets and comet every 10 days. Positions for January 1st 1981, a snow than "Jan. )." The seconding nodes, or points where he orbits for trees he explys, are considered to the property of the property

sky when the Turks threatened to overrun Burone in 1456, and when the Reformation was at its height in 1531 It struck terror to the Baxons under Harold in 1065, when they were conquered by William of Normandy This fear of the middle ages was dispelled only when Halley made his great prediction in 1522 that the comet would return in 1783, a prediction which was verified after the great astronomer

A comet which has reappeared regularly for over two thousand years must be composed of fairly enduring stuff Just what its composition may be, the

Just what its composition may oe, the present reappearance will for the first time enable us to tell, for in 1835 the spectroscope was not invented, nor astronomical photography perfected

THE THE ADMINISTRA DESADEOUGHTS

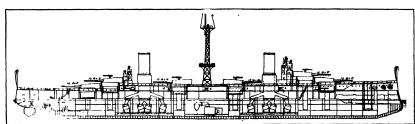
Thanks to two contemporaries devoted to South American Interests, Le Armer we are in a position to publish some quite complete information regarding the two new dreadmoughts, contracts for which have recently been secured by the Fore River Company Comparion will naturally be instituted between them and our lasted dreadmoughts, the "Wronting" and "Oklahoma." They are 30 feet about a foot loss draft, and their displacement is 1,500 tons greater The ships are as farlly protected, and if or

pectations are fulfilled, they will have we have greater speed, a result to which their greater length and fine lines will largely contribute innes will argued contribute the armor plan appears to be about the same, with the addition, however, of a certain amount of special protection against underwater attack. Because of the emplanement of the two central turrest disposally the endoughe, which tore and art, will be doubte that of our ships, the breadedist fire will be about the same

A study of the inhoosed profile for A study of the inhoosed profile for the profile for some 60 for the major to the forth for the profile for

and anomination rooms for the central pair of turreta. Fore and aft of these are the two separate sets of boller-room compariments, while fore and aft of these compartments, again, are the turret hoists and ammunition rooms for the forward and after pairs of turrets.

The separation of the one military mast from the neighborhood of the forward unokestack, bridges, conning tower and forward turrets is advantageous, in-



Longith, 201 fed. Means, 30 fed. Resplacement, 27,00 too. Bolt and Turret Armor, 18 holes, Armandags, Trefer 18-tock, to sire block and spain fluid, 222, 18-tock, 18

## Scientific American



moved from the favorite namery, which is a little asmuch as it is thereby remo alming point of modern gunnery, v forward of the base of the foremast

forward of the base of the foremast.

The position of the 6-inch battery, with a protection of 8 inches of armor below and 6 inches in front of it, must be considered vor, satisfactory, although the protection is not equal to the 9 inches afforded to the 5-inch battery on our latest ships. Excellent also is the protection of the smokerstack to a height of 18 fore above the war deck by a smokel sheet halter. of 15 feet above the spar deck by a special steel plate 1½ inch in thickness. The following particulars taken from The Standard

Buenos Ayres, will be of interest The main armorelt will extend for 250 feet in the center, and 4 feet 9 inches above and 3 feet 4 inches under the normal water line, the uniform thickness being 12 inches The armored band will extend 75 feet toward poop and bow to the barbettes, but with the this knes of 10 inch only Above the principal belt of armor for the whole length of 400 feet there will be armor of 9 inches in the lower part and 8 inches in the upper part to the height of the main deck. The bow and poop will also be protected by armor of 6 and 4 inches respectively On the main deck there will be a casemate with armor of 6 inches, in which the 6 inch guns will be The bases of the chimneys will be protected to 15 feet from the deck with a special steel plate 11/2 inch thick The total weight of the armor, barbet inch thick The told wight or the armor, parories, turrets sit. will be 7,000 toins The bottom of the ship will be protected against submarine mines with 680 tons of nickel steel. The turbine engines will be in three separate and independent compartments, and in three separate and independent compartments, and the bollers will be in six compartments, divided into two groups. The capacity of the coal bunkers is 4,000 tons and there will be tanks for 660 tons of potroleum. The turblines will develop 39 500 horse-power. with 25 millimeters of pressure of air in the boilers with 25 millimeters of pressure of air in the boilers. This, with a displacement of 27 500 from, will give a speed of 23% miles an hour for eight successive hours. With this speed the radius of action will be 3,500 miles, at a speed of 15 miles the radius will be 7,200 and with 11 miles an hour 10,100 miles. The cost of each ship will be \$11,000,000

### THE SCIENTIFIC AMERICAN PLYING MACRINE TROPET

CONDITIONS FOR 1910

The Scientific American Trophy for heavier-thanair flying machines was offered by the Scientist American for annual competition under the rules and regulations formulated and promulgated by the Acro Club of America in 1907

Club of America in 1997
The first trial for this cup was held at Hammondsport, N Y, on July 4th 1998, by the Aerial Experiment Association of Hammondsport N Y The minimum distance to be covered was one kilometer (3,280 feet) The trophy for 1908 was won by Glenn H Curtiss in the "June Bug," he having made a fligh of 5 000 foot. This was the first official public flight for a record made in the United States

The trophy was also won for the year 1909 by licen H Curtiss, who on July 17th fulfilled the new conditions of the competition for that year by co ing a minimum distance of 25 kilometers. The actual distance covered was 25 002 miles in 52 minutes 30 which was considerably in excess of the mini

mum distance required

Both of these trials were made under the supervision of the Contest Committee of the Aero Club of America

cordance with the deed of gift which pro In accordance with the deed of gift which pro-vides that the conditions for each context for this trophy shall be made progressive in their severity of test in conformity with the progress of serial navi-gation, the conditions to be fulfilled by the next per-son entitled to have his name piaced on the trophy shall be a flight of not less than 46 miles across country The contest for 1910 must be held within the United States.

## RULES COVERNING COMPETITIONS FOR THE SCIENTIFIC

AMERICAN TROPHY FOR 1910

I The trophy is to be the property of the club and not of the members thereof, except in the event that any one person shall win the trophy three times, in which case it is to become his personal property Bhould the trophy be won by the regressrative of some foreign citch amiliated with the Aero Cicle of America through membership in the Interpational Aeronautic Federation, it shall be held in the castody of such club, but it shall be schiect to competition

under the same terms and conditions as if it were still held by the Aero Club of America. Should the holding ctub, for any reason, be disbanded, the custody of the traphy shall revert to the Aero Club of America. Should a contest or trial under the rules not be held within a year from the date on which a foreign com peting machine shall have won the trophy, the foreign

peting machine shalt mave went the tropus, the correspondence of the cup shall give up its custody of the same and shall return the cup to the Aero Club of America, in order that the competition or trial for that year may be held in the United States of America

The conditions under which the competitive tests and trials shall be made shall be determined by the Contest Committee of the Aero Club of America and such conditions shall be made progressive in their severity of test, as far as possible, in order to foster and develop the progress of the art of aerial naviga

All heavier-than-air machines of any type what ever (aeroplanes helicopters, ornithopters, etc.) shall be entitled to compete for the trophy but all machines carrying a balloon or gas-containing envelope for pur poses of support are excluded from the competition

III In order to compete for this prize the con testant should file with the Auro Club of America a formal entry, addressed to the club at its headquar-ters in New York, declaring his intention to compete for the trophy Whether the trial is to be made at



THE SCIENTIFIC AMERICAN FLYING MACHINE TROPHY.

a recognized aeroplane meeting or at a special trial, the contestant should indicate the date upon which he seeks to make a flight. He must also deposit the amount of the fare from New York to the place of trial, and return

trial, and return
A reasonable time must be allowed for the representative of the club to reach the place where the
dight is to be held. If the trial is to be made within
25 miles of New York city, the amount of the fare
will be defrayed by the club. In case the Contest Committee find that the place of trial is too far dis committee and that the place of trial is too far dis-tant, and they are unable to arrange to have an offi-cial present, the confestant may be required to hold the trial at some convenient place mutually to be

IV The person or committee having charge of the test or trial shall make careful measurements of the distance covered by the flight, and shall prepare a distance covered by the flight, and shall prepare as written report of the less or trial, which shall be delivered to the Contest Committee of the Aero Club of America, and in such report shall state fully whether in his opinion the machine can be handled whether in his opinion the machine can be handed with safety, and, as far as possible, be shall determine the speed attained during the flight. He shall also take into consideration the question of atability and cases of control, and he shall state in his report weather

The flights will be made in as calm weather as

possible, but the contest committee or its representa-tive will at its discretion order the flight to begin at any time it sees fit, provided the velocity of the wind does not exceed twenty miles an hour. The ma chine may start by running on the ground or upon a track under its own power, but no special launching device will be permitted. There is no requirement as to the height above the ground at which must fly

VI Complete specifications of the competing ma-chine, giving weight, supporting surface and power of engines together with a description of the best trial of the machine, shall be forwarded to the Con-tost Committee at or before the time of making entry

for the contest.

VII The trophy shall be awarded for the year 1910
to the contestant making the longest cross-country
flight during the year. The distance covered must be

at least 40 miles as the crow files, or to a point 20 miles determined to the point of departure. The trophy shall not be awarded unless formal entry for the same has been lodged by the bona fide. owner of the machine with the Contest Committee of the Acro Club of America in accordance with the conditions elsewhere specified. The name and record of the successful contestant shall be appropriately inscribed on the trophy
VIII All tests and trials shall be under the off-

cial supervision and direction of the Aero Club of America, and all questions that may arise in regard America, and all questions that may arise in regard to such contest or trial shall be decided by the Con-test Committee of said club, and its decision in all questions of dispute shall be final, and without right

of appeal to a court of law or equity
'X In case the Contest Compiltee is unable to de
ermine which machine has made the best perform
ne during the year 1910 it shall arrange that a com tween such machines be held, and the ma hine making the best performance in such test shall

varied the trophy for the year

No trial or test for the year 1911 will be allowed until the rules governing the competition for that year have been promulgated

### Correspondence.

### MR RIEDERER'S PROBLEM

to the Editor

o the Editor of the SCIENTIFIC AMERICAN Referring to Mr Riederer's puzzle in the SCIENTIFIC ANDREAN dated February 19th, 1910 I take the liberty of submitting what I consider to be the most orderly

| 1 2 8   | 1 4.5   | 1 6 7    | 189      | 1 10 11   |
|---------|---------|----------|----------|-----------|
| 2 4 6   | 2 5 7   | 2 8 11   | 2 9 10   | 1 12 18.  |
| 8. 4. 7 | 8 5 6   | 8 8 10   | 8 9 11   | 1 14. 15  |
| 4 8 12  | 4. 9 18 | 4. 10 14 | 4. 11 18 | 2 12 15   |
| 5 8 18  | 5 9 14  | 5. 10 15 | S 11 19  | 9, 18, 14 |
| n 8 15  | 6, 9 12 | 6 10 18  | 6 11 14  | 8. 12 14  |
| 7 8 14  | 7 9 15  | 7 10 12  | 7 11 18  | 8 13, 15  |

any of laving out this nuzzle. I started with No. 1 I fook 2 and used what I could, then 3 4, 5 6 and successively which is about all there is to do

waverly lows H N Woodrone.

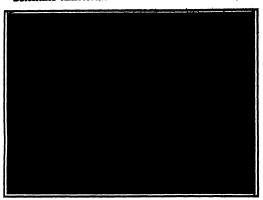
## The Current Supplement,

W P Dreapers excellent consideration of the artificial silk industry is concluded in the current Burris-MENT, No 1786 Attention has been again directed to the possibilities of radium as a curative agent by Sir William Ramany and Sir Lauder Brunton For n an article on the subject in the current SUPPLEMENT should be read with interest Lucian Fournier describes the freezing process which was em-ployed in the construction of the Paris Subway The case of Wright versus Paulhan, and some extracts from affidavits and Judge Hands decision in the case of the Farman and Hieriot acroplanes is concluded H. Thurn writes on airships, wireless telegraphy, and atmospheric electricity Most interesting is an article by T Kume on Japanese pearl culture, in which he considers the pearl historically in Japan, mentions the Oriental bivalves which produce the best pearls, and then describes in detail the method employed by Miki moto for the artificial culture of pearls ments on the expansion of air by heat are describ Automobilisis will read with interest an article on a variable stroke gasoline motor Prof T J J See contributes a thoughtful paper on the origin of the lunar craters, in which he endeavors to show that th wonderful craters may be explained by the impact of some sort of projectiles W Nernst contributes an article on general and physical chemistry in the last

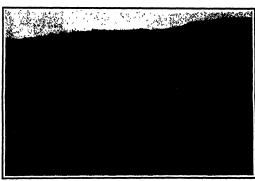
A NEW TELEPHOTO CAMERA BY THE PART CORRESPONDENT OF THE MISSIPPE ARESICAN
It may seem far casier than it is to construct a It may seem far caster than it is to construct camers which will give an onlarged image so as to bring out the details of objects at great distances. To give a large, image a long focus is not in required, of four foot focus for casmiple. But a camera to use this lens must be of vry great length and weight, and cannot, therefore, be said to be portable

In the instrument illustrated which was designed on the Vantier Dufour and Scha system, the inventors on the youther Durfour and Schä system, the inventors have solved the problem on prescribe the focal length of the lens and at the same time reducing the volume and weight of the apparatus by cutting the formal length into thirds with the attle of two milrors. At O is the lens which lies in the upper part of the double how fire this passing through the lens are reflected from the upper mirror M placed at the back of the box to the mirror M' at the front end of the lower section, and thence to the usual ground glass P section, and there to the same a camera of sixtees inches length is sufficient for a lone of four-foot focus, with an evident assing in weight and reduction of volume such an instrument is quite portable. The upper part Such an instrument is quite portable. The upper of the camera is made on the extensible plan, s drawn up and out of the lower box when the photo-graph is to be taken

Up to the present time the different combinations of lenses for telepholography have all had one great fault namely, a want of luminosity and consequent difficulty in focusing It was almost impossible to the such lenses for snap shots. The camera illustrated takes instantaneous views in the usual way. The



The city of Neuhausen and the Rhine Falls taken with an ordinary camers



A photograph of military maneuvers taken with an ordinary camera.

as opening is always in ratio with the focal length ions opening is always in ratio with the focal tengen of the lons, \$10 to \$12\$ for the outer rapid. The luminosity is thus always sufficient for instantaneous work. For the photography of inaccessible places, such as mountains or details of architecture or scenes. in which the interesting spot is at a great distance from the observer, the new camera performs very good work, as will be noticed in some of the engravings presented here. In a balloon the new system renders it possible to take rapid instantaneous views which would be impossible with an ordinary teleobjective Such views are very difficult to take, not only because of the distance of the objects, but because

of the objects, but because of the continual move-ment of the balloon, which makes rapid anap-shots necessary Snap-shots can now be taken up to 1-1,000th

second which would be quite impossible with any tele-lens with which we are ac-quainted. At the full open-ing the present lens gives pictures which are sharp up to the edges of the plate. The present camera has already undergone trials in a first believe on board the

a free balloon on board the

M' and from there to strad place P. In this or a camera of Minches gth suffices for a lens

halloon 'Mars" of the Swiss Acro Club, and the photog rapher took some very sharp views, which it would have been impossible to obtain with an ordinary apparatus

Its use in field work is shown in two of the annexed clews representing army manouvers. In the first

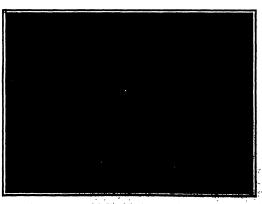
view, taken with an ordinary camers, the troops in the background can hardly be distinguished, while in the second view oclearly see the individual soldiers and can follow all their movements with ease One of the view shows a photograph, taken on board the balloon. "Mara," of the town of Neuhausen and the Rine Palis at an allitude of 1,000 meters (1,400 meters) (4,500 meters) (4 from the same point with the new apparatus. Its us in architectural work is also seen

## Why Are We Hight-Handed?

way we sugar-manear are one x a man, x, x, x.

From time to time ambideaterity is extelled as generally destrable, and there are to-day educators who consider that development of the loft, coequal with that of the right hand should be begun with the entrance of little children in our achools It is, therefore, perhaps profitable to discuss in what manner right handedness—by which I would here connote right-stirdness in general—has become habitual among 96 per cent of human kind; and whether ambidexterity is really desirable

The lower animals, at least those which have not been taught tricks, use their fore paws indiscriminately, the cat strikes at a fly or plays with a mouse indifferently with either or both paws; the squirrel manipulates nuts and clings to branches quite as in-differently. Even in monkeys on gorillas, which of all animals use the fore paws mostly as hands, there is no suggestion of preferential use or superior experi-



The city of Nonkission and the Rhine Palls taken with the Vantair-Defects camera-A MEN TRADESCO GAMERA

## Scientific American

ness in the left or the right hand, states Dr. G. M Goold, but animals can be tu-fored to use one or the other paw, the charten of the other paw, the charten of the other paw, the charten of the other paw, the charten hands with the right paw; the monkey to shoot manufect but at the right aboutier A no nr microsephanic iddocs, and in the right handselness and am bid exterity have been found to reach a proportion of the as we calculate the right handselness and am bid exterity have seen found to reach a proportion of the as we calculate the right handselness, and as we exclude disease, we find that ambidenterity progressive for the right handselness and the rig

Army maneuvers taken with the Vantier-Dufour camera.

years ago, that "by the superior skill of his right hand man hath gotten himself the victory" in the svolutionary struggit. To try to undo his dextral pre-eminence is to make for devolution. Glimpses of

right-handedness in man, it seems, and are manifact in the bronne age and in Palsolithic times. It is ordent in the art of the act of the ancients—Assyrian Oracian, Rigputan Historic Investigation shows that all peoples, however savage, have uniformly used by preference not only one but the same preference not only one but the same races to-day manifest, either handed near, but this is in the last degree doubtful Sixch statements have, for example, been made concerning the Japanes—that they are by law and practice emblet-irous. But Baron Komura has given positive assurance to the continy für James believes to the continy für James believes to have been been better the statement of the continy of James believes any fully developed and civilized hu man beings, though sometimes verure.

Most human beings, then, are righthanded, though of course, there are those of great intellectuality and force who are ambidextrous having educated themselves to this end, and are exceptional by reason of the peculiar and special training they have undergone. The origin of right hand

undergone The origin of right hand ednoes will be found, i believe, to lie much deeper than the individual's voluntary selection whether he will use his right hand or his left, or whether he will be ambidextrous, the reason is to be found in human anatomy—in the position of the heart, and in the cerebral structure and organization by which latter all voluntary movements are directed and controlled Consider in the first place how the heart and its

The Parthenon taken with an ordinary camera.

great arteries are left-sided, though in the primor dial organism from which we have evolved there was, it seems, no such symmetry. The savage, from time immemorial, has protected his heart with

his left, his shield arm, but his aggree but his aggres-sive manipu lations are made with his right, his spear arm The modern anvage though too h e bears 'nо shield — which would be use-less against modern weapons - fires his musket uni formly (in a double sense) from the right shoulder, sighting with his right eye, the sword also .oe right hand %



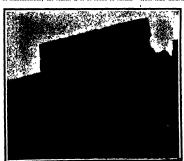
Again, in obs dience to the universal next for barter—so Dr Ooude points out—the primitive practice was counting with the low numbers, one to the free dexiral hand were first used, and all fingers are new called digits, as are the figures them selves, and the basis of our numbering is the decimal or to fin greed system. The second impor

The second important fact in human anatomy is that all our voluntary movements are directed and controlled in the cerebral structure and organization. The brain has two hemi spheres, of which the right presides, by means of certain de-

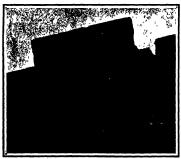
cussating nerve fibers, over the left side of the body, while the left brain presides over the right side. And fluctional differences in the two sides are connected with and contingent upon differences in the two heart where The left brain, in all right

An extremely important austomical consideration is that in right-handed people the "speech center" is situated in Broad's convolution in the cortex of the left frontal lobe, while in left-handed people the speech center is in the same position, but in the right frontal lobe Now It has been found that damage to Broad's convolution in the left hemisphere deprived the right

handed man of speech, which is unimpaired in the left handed man under the same circumstances, the left handed man would suffer in the same way, were (Continued on page 288)



Detail of Parthenon taken with telephote camera.



The effect obtained by ordinary enlargement of a detail in a photograph.

# THERMAL TREATMENT OF STEEL INGOTS

## BY J. F. SPRINGER

There are two considerable imperfections which ac company the cauting of steel ingots. The more conspicuous one is that of the pipe. This is a conteal cavity which forms in the upper portion. In Fig. 1 we have in the center two longitudinal slabs taken from steel ingots which nothint the pipe very.

from site I ingoins which eachbil the pipe very cheart. In mound explanation of this curtous formation regards it as a consequence of continuous and the continuous and the continuous and the continuous and the full when the ingoin has cooled off. There is in fast a columeric loss of perhaps the continuous and the full when the ingoint has cooled off. There is in fast a columeric loss of perhaps the continuous and the continuous

substantial character of those shown in Fig. 2. Their couling effect is consequently a Fig. 2. Their couling effect is consequently a Fig. 2. The couling effect is consequently a fine cooling linguit will constitute a shell conformation to the sides and bottom of the moid and containing a heavy mass of motion steel. Now, shelter expansion or contraction takes place at the very moment of freezing, the sites of this shell will undoubbelly steadily contract As this goes on, it meets resistance from the weight of the liquid within the properties of the second of the second

To climinate the pipe many procedures have been employed. These divide the mis-less into the mechanical methods and thermal ones. Perhaps the most auccessful process with than yet found fits way into comparing the procedure to the Harmet procedure described in an article by the author in the RED NOTHER AMERICA. 1999 Methods, such as this, operate

with a view of eliminating the pipe through the foring in of its walls upon themselves while the interior of the ingot is in a liquid or plastic condition. The elaboratoness of the apparatus necessary, and the length of time required, are serious considerations.

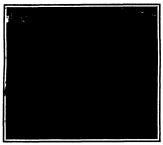


Fig. 1 —The six transverse siahs and the right-hand vertical siah were poured by the hot-top process.

which operate against some, at least, of the mechanical processes. But offers have been made to solve the problem by thermain mean. If the steel at the operation by thermain mean. If the steel at the operation of the inget becomes solid, then with such a reservoir perhaps the pipe could be progressively filled up at the formed. Upon some uset fundamental idea the the mail processes depend Krupp is said to have poured motion size upon the tops of the ingets. Apparently



Fig. 8.-- "anveur's overflow method of pouring ingots.

but Hitle is known of the measure of success. This might, private a provide a good method. The angist, private a provide a good method. The over specific arrange of the private provides and the private private provides and the private private provides and up, the pipe will be reduced. In fact, a very considerable shortening has been accomplished in this

way Experiments have been tried where the metal was steel, rinc, and waz. All show improvement No doubt this effect is due to the retardation of the cooling thus effected at the top by the provision there of a larger mass of metal. That is to say, the pipe is shortened if cooling is accomplished from be-

shortened if closing is accomplished from betow There is, however, a storag objection
tow There is, however, a storag objection
reduced, the pipe is also because its breach
and thus involves more metal in preportion to its length. Its corrective influence is thus discounted somewhat There is
another objection on the acore that this
method would involve complications in stripping the molds from the inputs. However,
the method would involve complication in stripping the molds from the inputs. However,
the thing the control of the compound by
means of a rod into the upper portion of an
inger, the pipe could be somewhat shortened
This result is, no doubt, due to the considerable heat set free upon the chemical reaction
believed the result in the same direction an
account of these experiments with wax in
gots carried out by Prof. How and Stough
ton give evidence in the same direction an
account of those experiments may be found
in an article by the present writer in the
Scinnytz Ansata Ay for Agril 24th, 1969,
where the marked differences in the length of
where the marked differences in the length of

4 and 5. In the cases of Ingota Nos 8 and 7 we have the centrast realized by keeping the temperature but at the top and cool at the bottom and vice cross The difference measured in percentage of ingot preserved from piping amounted to 48 per cent This devantage of nearly one-bulk the whole lingot was in favor of the hot top. Of course, these superiments favor of the hot top. Of course, these superiments favor of the hot top. Of course, these superiments favor of the hot top. Of course, the superiments favor trind with sized by what may be called the overflow method This is Prof Sauvour's process. A number of molds were arranged in a way not unlike that disclosed in Fig 2 Dy pouring continuously into the one on the left all may be filled I twa thus found upon one or more overaloss that the first and second ingots whose heads with liquid supples of sized, chickeded no pipes. The next two had small pipes, involving about 4 or 5 per cent of the taget kingth.

Now all these experiences prepare us to expect a decleded surcess from the Rimers bot lop process as used in Gormany. This insertior applies a gas furnace to the ingot top. Apparently, however, others had had a similar idea. It would seem that their processor it caved but inconsiderable attention. Now Riemer not caved but inconsiderable attention. Now Riemer not caved but inconsiderable attention. Now Riemer and Further, he provides an immerse experience at at 10 Further, he provides an immerse experience of a creat over the top. However whether we understand why it should seem nevessary to the formation of a creat over the top. However whether we understand that the provides are inconsistent of the provides and the provides are understanding in great amount but with great promptness the fact Concluded on app. 300 1

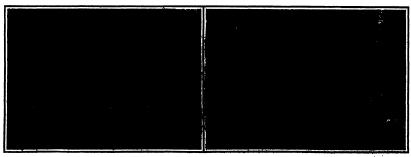


Fig. 2.—Gas furness is here being used to probast the mold before pouring. Fig. 4.—Gas furness in operation beating the top of a Sédon ingot while metal the large.

PRIVATION OF PRIVATION OF PRIVATION BY EXEMPTION OF EXPLANATION OF PRIVATION OF PRIVATI

# EGGS OF CURIOUS FORMS

## BY PERCY COLLINS

When we consider that with the exception of the class manualis, practically every creature dwelling upon the sent hat the present moneson began life except the sent of the present moneson the part of the sent o

whose habits comparatively little seems to be known, save that they subsist mainly on insects, and that they really do lay eggs.

My do more detailed accounts are extant respecting

Much more detailed accounts are extent respecting the habits of the duck bill Oratiforhynk-kes persource (as science terms it) is not unlike a gianute mode in shape, save that it possesses a remarkable tail and feet and bill of duck like design. Its habits closely resemble those of the common water rat. Frequenting the streams of southern and ceatern Australia, it makes it as burrow in the bank Here Mother Duck-bill lays two white, factible-boiled eggs, about three-quarters of an inch is length When girst about three-quarters of an inch is length when girst source and the state of the size of the si

hatched, the tiny duck-bills are both blind and naked, but in process of time they acquire the adult characteristic, and issue from the nest hole to feed and frelic in the river with their parents

Leaving now the mammalia we find that all known birds lay eggs, the largest being that of the ostrich Many of these eggs come from Africa, and after being stratched, painted. "poker worked" or otherwise adorned, are used for decravity purposes. Thus we are all familiar with them, and can resilise that the contents of one would form a bountful meal But the ostrichs sork would have appeared quite small be-Confision of the contents of the conten



Duck-bill and egg.

Male midwife free

Onckee and its ogg compared with kiwi and its ogg

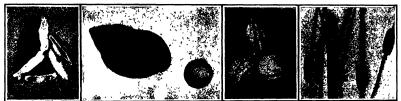


1 Egg cluster of common whole. 2 Egg-chain of turret shell.

Egg-case of

Egg-case of hammerhead shark

Typical cluster of snakes'

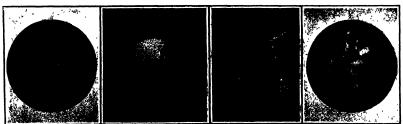


Engs of bousedy (magnified).

West Indian Bullenus shell and egg

Eggs of a moth (magnified).

Egg clusters of Mantis or " rear-horse



Eggs of parasite of horabili (magnified).

Rag of gaptier tertains—a perfect

Egg of parasite of domestic fowl (magnified).

Egg of parasite of a hird losse (magnified).

# CURIOSITIES OF SCIENCE AND INVENTION

### MOTOR-CYCLE AUXILIARY FOR BICYCLI

A power attachment for bicycles has recently been invented which calls for no structural alterations to be made in the ordinary bicycle and which can be attached or detached in a few minutes The device comprises a small auxiliary when 20 inches in diam eter fitted with a light motor which is connected to the rear wheel of the bicycle. An ingenious pivoting



A POWER ATTACKMENT-FOR BICTCLES.

arrangement allows the wheel a poculiar lateral and vertical movement, so that the steering of the ma thine is in no way affected and permits the wheel to gitde over obstacles or rough ground without trans-

gives over contactes or rough ground without ran-mitting any abock or vibration to the rider. The motor is a small air-cooled, bertsontal, two-stroke engine with a specially designed but to which the power is transmitted through a six to one reduc-ing goar. The magneto ignition and vaporiser are mounted on the same plane, and in line with the co-

ing goar The magneto ignition and vaporitar are monated on the same plane, and in line with the engine, so that the whole is rendered very compact. The engine is valveless, the indict and enhant being governed by ports, alternative curvered and uncorrect the property of the control of the control of the property of

## A ROYAL HIGH-POTENTIAL PRIMARY BATTERY.

A new and ingenious high potential primary battery, the purpose of which is to supply electric charges at known potentials, was recently exhibited before the English Physical Society The positive element of each cell consists of a small carbon rod, while a strip pure sinc comprises the negative element, the ele-siyte being a solution of calcium chloride of pure si

The connected ends of the elements, which are counted in parallel rows of 25, are buried in paradin.



A HYGROSCOPIC HIGH-POTENTIAL BATTERY.



CARBON BLEMENTS.

is just broken by a small pellet of parafin, and the liquid is retained between them by capillarity

itude is retained between them by capitarity
The electrolyte comprises a saturated solution of
calcium chloride which has been exposed to the air.
Being bygroscopic it will absorb water until a cartain equilibrium strength is obtained, this factor depending on the humidity of the air and the temperapending on the humidity of the air and the tempera-ture. The electromotive force of each cell differs from one voil by only two or three per cent if exposed to very different conditions of temperature and humid-ity, but it has been kept steady to within 01 per cent

for two or three consecutive days.

In conjunction with an electrostatic voltmeter, the battery is very convenient for the following purposes in all experiments involving the use of a quadrant in an experiments involving the use or a quadram voltimater, as the needle can be charged to any desired voltage up to 1,000 volts, since the battery is so designed that one or any number of elements can be taken, for the comparison and calibration of electrostatic voltmeters, for the comparison of capacities, and for the measurement of high resistances by the method of discharging a condensor through them and noting the time taken

### DETECTOR FOR FIRE-ALARM BOXES.

The problem of so designing a fire alarm box that it can be opened and operated by any one in an emergency and yet will tend to prevent the sounding emergency and yet will tend to prevent the sonating of false alarms, is one that has engaged the attention of lawestors for many years A very ingenious solution of the problem is presented in the accompanying illustrations. The alarm box is closed by a cover which has to be raised as shown in one of the illustrations to permit the operator to insert his band through an opening and release the alarm mechan ism. At the moment of the release a handcuff closes over the wrist of the operator, as illustrated in anover the wrist of the operator, as insurrated in an-other photograph. The handcuff is not challed to the alarm box; for this would make a prisoner of the operator of the alarm, whose services might be badly needed at the fire Instead, however, the handcuff should be of value to small as well as large dealers. The machine consists of a megazine and a means of taking one cap at a time from the magazine and pressing it firmly into piace on the top of the milk bottle. It not only adds to cleanliness in dairies, but saves time, inasmuch as it is many times more rapid in the operation of capping bottles than the hi

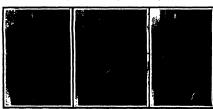


PORTARER ROTTLE-CAPPING MACKING

hands. One type is portable and is operated by a quick squeeze of the handle. The other type consists of a battery of cappers which will operate to cap a number of bottles at once The magazine take caps in packages from the machine which made them ites the necessity of handling the cap itself

### UMBRELLA SHELTER FOR AUTOMOBILES

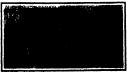
It is impossible to enter a vehicle on a very rainy day without getting wet, because the umbrella must



Compting the alters DETROTOR FOR PIRE-ALARM BOXES.

erves merely for identification. It is made of such from that it cannot be concealed under the coat glosve serves merely for identification it is made of such form that it cannot be conceased under the coat sleeve and it betrays the sounder of the alarm to the gen oral public, and is an honor to a man unless the alarm is a false one. Not until the fire chief has arrived with a special key to fit the handemy at the device be removed. This system is also applica-ble to boxes which are locked. It frequently supplies in such cases that the keys are loaned out and it is impossible to determine who sounded the alarm even whom it is known whose key is missing.

OFFIRE SILLSONIES BY RACETER. (Greater presentions nor than the handling milk than any other form of food, because it is such as accellent medium for breeding grams. Hand work is always objectionable because of possible contamination from unclean flagers. Hereforer milk bottles have commonly been capped by hand. Now a simple machina has been invented for doing this work which



A MACRINE FOR CAPPING FOUR WILE BOTTLES AT

be lowered before one can step inside Surely it is just an nocessary to provide vehicles with some sort of a shelter, such as the awning of a store or the marquee of a public building However, anything projecting from the side of a whelce would be objectionable. The difficulty is surmounted quite cleverly in the automobile, while is illustrated in the accompanying engraving. A collapsible awning is attached to the oport the sutmobile, said also to the top of the door, so that when the door is opened to admit the peanment or to allow a passenger to alight, the awning senger or to allow a passenger to alight, the swring will open and protect him from the rain while be is raising or lowering his umbrella. When the door is closed, the awning shuts up like a fan.



THREETLA COLLEGE FOR APPROPRIES.

| MANCH 26, 1910.   |  | American   | 26   |
|---|--|--|--|
| Perioding to Apparel.   | after being chilled, will be assisted in its dis-<br>charge from the mold by the contrifugal force<br>developed by the revolution.   | Certier für bidder's fluid earlier Charles, postere proc. Beglind à Lebter Cercut stewing segments. A Politice Cercut stewing segments. A Politice Cercut stewing segments. A Politice Charles fluid extensive, realing A A College and College and College Charles and real Asserte. A L Universal College and College and College College and College College and College Co | Purpages, feeding mixed furls to A H.  |
| ARCH SUPPORT—P Hawken, Mariboro,<br>T An edge-t of this invasion is to pro-<br>do an attachment for the shoc which will<br>suffershally support the arch or instep at all<br>interesting support the arch or instep at all<br>into, and will at the same time provide<br>equate vanilation for the interior of the<br>co- without admitting water from the streets<br>which the shoc might happen to be placed.   | developed by the revolution.   | Chaing, puncture priof, Regitals & Lichtenstein<br>stein stein 962 072<br>terral steeping apparatus, A Pritzer 962,186<br>Chair came E. Tun 901,557  | Paragaces, feeding mined faris b A. R. Mann Mann Mann Mann Mann Mann Mann Man  |
| I An object of this invention is to pro-<br>se an attachment for the shoe which will  | GLASS-MOLDING MACHINE.—W J<br>MILLER, Coffsyville, Kan. The object here is<br>to convert semi-automatic machines of a cer  | Chair cane E Trin 951,857<br>Chair fan attachment, rucking A. A  | Garment support and forte combined it  |
| mfortably support the arch or instep at all   | to convert semi-automatic machines of a cor  | Brodeur<br>Chair head rest, barber, A. L. Undeland,  | One apparatus, vertical retort J H Taus-<br>nig III<br>One burner Mintler & Jennius III  |
| equate ventilation for the interior of the  | tain type into practically automatic mechines. The lawnitic consists in part of a pair of shear arranged at the charging position and adapted to cut off the gians as it is insent adapted to cut off the gians as it is insent into the part of the position and adapted to the patherer the abears being actuated by the punty or pontel as the gians is placed in the mold  | theck look of Shormaker 953,147  | On appointment worked noted J II Two- ments affected to Agreement and the Con- ments of the Con- ments |
| se without admitting water from the streets<br>which the shoe might happen to be placed.  | shears arranged at the charging position and   | Rekardt 852,418<br>Chuck, T J Figley 95,7320   | Gas from peat making I J Nockl v K.<br>Gas igniter and extinguisher J C Landes 165   |
|   | into molds by the gatherer the shears bring  | Librath beyond 1 in Tones 2 with the Control of the | Gas producer M B Crowth 165  |
| Of General Interest,  | actuated by the purity or pontel as the glass<br>is placed in the moid   | Clock, intermittent siarm, W E Porter 002 212<br>Clock movements and the like, motor for S.  | Cambene burner A J Blackford 155<br>Cambene indicator M II Preston 85  |
| Of General Interest,  FOUNTAIN-UNN—C B. MARTINO, and C.  FOUNTAIN-UNN—C B. MARTINO, and C.  FOUNTAIN-UNN—I IN this Instance the in to trovide a fountain per having a  ree cuty which forms as lisk tight joint when position to every the pen point, so that  tak rainnot seeme to any part of the holder  per accion, and in which evaporation of  tak in the barred is prevented.  | Nora.—Copies of any of those patents will<br>be furnished by Munn & Co for ten cents each,<br>Please state the name of the patente: title of<br>the invention, and date of this paper  | W Bramle # 951 903<br>Clothers moistening device T Hase 951 901  | Gearing R Polx to Gearing Rodgers & White the Control of the Contr |
| a in to provide a fountain pen having a   | be furnished by Munn & Co for ten cents each,<br>Please state the name of the paigning title of  | Clutch, T O Johnson 951 902<br>Listch device W Goldberg 951,882  | Glass, appearance for milling wire, A Mayer 16.  |
| position to cover the pen point, so that  | the invention, and date of this paper  | Clutch, hydraulic C A Biblachter 1852 217<br>Clutch operating mechanism for cranes,  | Wadeworth UK   |
| pro section, and in which evaporation of  |  | Coal darribating apparatus, A former 85, 920   | tion of sheet J Player (Glass obstracts no process   |
| tak in the barrel is prevented.   | Legal Notices  | from Lower & Bernhard 151 1071<br>Country braks, F W Fm 15-1 8-90  | d Untublatt  |
| Year in the carret is prevented.  An object of the invention is to provide wide datalise of construction for an instrumentalish will refer to get from the sum or artificial source, in radial lines, towards points of the compans, and more particularly to the compans, and more particularly compans, and more particularly compans, and more particularly compans.   |  | Conting matcher Physics 11 Remoder 532 088<br>Cork for steam boilers try Kelly & Gerds 532 088   | Globe collapsible goographical II II Van   |
| eri details of construction for an instrument<br>lich will mile t light rays from the sun or  | PATENTS  | Collars, marbine for fidding and ironing the collect of 1 Microstreler 051 017   | foold and silver from one silmen extracting  |
| artificial source, in radial lines, towards   | IAILI  | Harrington 0.2 328   | toold and silver from one silvers extracting A F trace Gradual processes to be and R. White soor of Gradual bin workship R R Norquist Gradual bin workship R R Norquist Gradual divider Randol A Med ann Liram critiquing matchine K Weens 55 Grater bar N W Blanchard Grater bar A W Beggan 80  |
| ly in a horizontal plane  | INVENTORS are invited to communicate with  | graphical Hollourne & Longhurst 951 948<br>Commoling machines, means for leveling  | Grate bar N W Blanchard 96   |
| FREE-SPRAYER -F G HATES, Sharon, Pa   | Mann & Co., 361 Breadway, You York, or Shi F Street, Washington, D. C., in regard to securing valid patent protection for their lavestions. Trans-Marks and Copyright registered. Bodge Fatents and Foreign  | Companing hardsines, means for leveling the control of the control | Orinte bar J & W Bragan 95<br>Orinter and polisher, N Adam 95  |
| liayon provides a light apparatus adapted<br>be operated from a position much lower than,   | to recurring valid patent protection for their in-   | instricts in typographical (* Mecki<br>class.) Composition of matter, Vaptag & Herrath 952 300<br>Composition of matter, Vaptag & Herrath 952 300<br>Composition of matter, Vaptag & Herrath 952 300<br>(* 1984 500 ) A. Buskirk 953 (* 304 500 )  | dirinding will, rider F 1 Matthews 95<br>Gripped mechanism C 1 an Middlesworth 95<br>dimmed atthe sprains supervises F 8   |
| usual spraying towers, provides an appar  | registered. Design Patents and Foreign<br>Patents secured  | tosterete risterna, nevern und the like form for G G F Bonnell 102 088   | tion for scaring birds or like purposes  |
| ich may be extended or retracted from the   | A Free Upinion as to the probable patents  | towers to construction transless measure for US2 250 Control from 1982 A O Consumption 982 971   | automatically operated W Roseler 96:   |
| rating station, provides for extending and  | hility of an invention will be readily given to any<br>inventor famishing us with a model or sketch and  | Concrete fruit post A O Consingham 9.2 071 Concrete walls, apparatus for molding G   | G T His kham<br>Hale water A. H Bowers 95  |
| by is a bordsontal plane  REKE-SPUA-SER — P O II JATAM, SHATON, I'A  I Hayon provides a light apparatus adapted be operated from a position much lower than usual apraying towers, provides an appar as for directing the slud being sprayed, lich may be extended or retracted from the reating station, provides for catending and rareling the operating position of the spray of device and provides a prayer operation by device and provides a prayer operation.  | Patents secured A Free Ulpates as to the probable patents hilly of an investion will be readily given to any inventor farmishing as with a model we stack and a brief description of the device in question. All communications are strictly confidential. Our Hand-Beeck on Patents with be sent free on its confidential of the conf       | Confessor, surface C G Curtis 902 102<br>Confessor T L Smith 951 No.   | Lond Links Street From the Miller Street Str |
| DIPPORT FOR DISPLAY MATTER -T   | Hand-Book on Patents will be sent free on  | Conter, compressed steam N T Baness 5.2 112  | Hammos h support G W Bent<br>Handle Res Lump handle  |
| BRINGTON, New York, N Y This invention  | Ours is the Oldcot agency for particing patents:  [it was established over sixty five years ago.   | corp proding and nesting Prescutt & 252 inc. (oracle right) I Wilson   | Harrow of B White<br>Harrow seljusturell, disk, R H McLaughey 68<br>Harrow dreft bar R. A D McHowen  |
| BUITTHET FOR DISPLAY MATTER—T<br>gatteeres, New York, N Y This invention<br>emportally applicable to theatrical advertising<br>use in hotels, railroad stations, and other  | it was established over stary five years ago.  | (of collapsible R C Rassumes B 55, 211   | Handle Net Tripp handle   Harrow C B White   Harrow S Relative S Malboar   Harrow S Relative   |
| ble or semi public places in large cities,  | MUNN & CO , 361 Broadway, New York<br>Granch Office, 625 F St , Washington, D C.   | Cutton chopper, R It Gibeon 251,007<br>Cutton chopper W Dittrich 162 510   | Harroster P J & W N Triplett 92<br>Harroster combined B Hot 95   |
| ployed in connection with advertisements,   |  | The Workship of the Control of the C | Hart or "The kines Downer or "I garbent of the Common of t |
| ne, or displays of other character or matter  |  | Create a parator, N H Morague 003,220<br>Cuttivator, R L Kilpatrick 951 950  | The property of the party of con \( \) In Ing property of Quiden (1) Ing pr |
| us, or displays of other character or matter<br>LECETPACLE-CLOSUME — II. U ADMAS,<br>yward, Cal. The object here is to construct<br>closures so that the ball and the cam men<br>may be turned relatively to each other and<br>the cover and recytacle, when by the parts<br>y be easily and capoditionally assembled, and,<br>there, to so construct the ball and cam men<br>that they may be stemped from sheet<br>fall and the cost of manufacture thus brought<br>at land the cost of manufacture thus brought<br>and the cost of manufacture thus brought<br>and the cost of manufacture thus brought<br>and and the cost of manufacture thus brought<br>and the cost of manufacture the business<br>and the cost of manufacture the business<br>and the cost of manufacture the business<br>and the cost of the | INDEX OF INVENTIONS  | t universe? H E. Held 902 115<br>(univer hair, W M William) 952,7846<br>(united device hair H W Payrolds 984,785)  | Inny people N F turtle 95<br>Inny tedder H M (tugber 95<br>Heartlight automobile W H Towns at  |
| closure so that the ball and the cam mem  | For which Letters Patent of the  | turtain pole lare W T Tenrier 953 134<br>(urtain red J W McMalon 961 832   | Heating furners W Pisher 96  |
| the cover and receptacle, when by the parts   | United States were lasted  | t seption 11 Helmon 002,247<br>t utter bar A Dahma 051 805   | Hinge P W Parusus<br>Hinge B L William 95  |
| ther, to so construct the ball and cam mem  | for the Week Ending  | t utters, rost gage for Smith & Braus B51 072  | Hondhark W J Parvis<br>Horn support P L. Alken 95  |
| that they may be stamped from sheet   |  | Hancork 952 641  | Hopeldiffer F B Combos 95<br>Hydrogarbon burner J L Henry 95   |
|   | March 15, 1910,  | Dental instrument, M. W. Wallace, WG1 860 961 861<br>Dental a bridgework W. A. Baron 962 220   | lee cream freezer G F Dickent 95<br>lee cream freezer A 11 Marc 95   |
| MANUFACTURE OF BREAD -C A Hau-  | AND BACH BRARING THAT DATE   | Destinat a mainteel W. H. Miller 1942 457  | solar W T Skilling at a St. Incomment of all the state of |
| inc France This invention relates to a  | (See note at end of list about copies of these patents.)   | Digester and extractor in fined rotary D   | illuminating and properting apparatus and y T Skilling and T Skilling In Increator, F I I bearing at 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   |
| el ginten broad, thry rich in nitrogenised stances produced by the incorporation of a   |  | Display suck for burial casks to foldable  | Iron melting and redning II Johnson IA<br>Ir ning board A. M. Garman III   |
| uble casein obtained from milk. It is of  | Art trions generator, C. C. Wakefield 1853 2888. Arid ustaining acidylic derivatives of extern   | Display stand Jewil G C Ruschert 942 141   | Jack () H Mueller 15   |
| MANUFACTURE OF BREAT—C. A Hara-<br>ser, 8 lius de Chomita de Ver, Nautorro,<br>ser, 8 lius de Chomita de Ver, Nautorro,<br>rel gitton bread, 4 rep; rich la nitropanisad<br>stateces produced by 100 involvention of a<br>ubbe carein obtained from milk 11 to of<br>reside tasts set as institutable in the<br>reside tast set as institutable in the<br>resident as propositions to do our rich in<br>ten and permits the complete locupora<br>of the cases, but as redding the formatties<br>of the cases, but as redding the formatties   | Fourness Acids preparation of raters of oxyamine E.  | Distributer J O Helms Jr Hendricks 1601 813<br>Duor chock and bolder O H Hendricks 161 817   | Jack hox conflets II O Rugh 25<br>June 1 mounting y White 20   |
| rated a process which permits of adding   | Adding machine, M. M. Plummer 903,137  | Medianer Washing the Control of the  | Issues, J F Haffiy 65<br>Klin feeding assistator, R Horbite 95   |
| iten and permits the complete incorpora   | Air brake W S. Hilbrey 952,356 Air brake system, direct. A lines 951,967   | Doubling mechanism I C Steele 982 062<br>Drinking cun A R Hoses 952 167  | knows on spindles means for adjusting and  |
| tumps.  | for V J Kochier controlling device   | Irrinking cup, seeptir J (1 Mbaron 903 MS<br>Irriving genz, J M Mailer 952 145   | looking door ( O Nonch ST Reputing and Labeling machine hottle M M Norce 15 Labeling machine hottle M M Norce 15 Labeling machine 15 A Johnson 15 A Johnson 15 A Labeling Machine M Company 15 A Labeling Machine M Company 15 A Labeling Machine M Company 15 A Labeling M Co |
| Hardware and Tools,   | Activities greening, t. C. Wahndede of the Control        | Secretary designation of the control | Street, and the street, and th |
| WIRM BOPK CLAMP —C A McCarthy.  | Angle pieces for use in structural frames  | terials, apparatus for 1 Turtur 151 8.41 Pemping mechanism M A Young 0.2 (6)   | Lamp receptants for cleatric signs, electric W Ruby relates 1 Lamp weeket cleatric J G Peterson 80   |
| tilesburg, Miss. One of the important fea   | mecalite standards, etc., rigid metal, P<br>Phippia<br>Auron blackswith a. K. (* No. 1 across 1 acr | Saves trough guard F M Deltah (5) 803<br>Rayes trough guard F M Deltah (5) 803<br>Ray beater, H F Mahr   | Lauterns, side and shutter operating divices<br>for magic Oblibid & Mina.  |
| brantus provides a practical one built  | medalite standards, etc., rigid metal, P. Phipps Apron blacksmith s, R. C. Boximano Automable controlling scenes, II R. C. Moll 1984 Axion, driving mechanism divided, U. ft. Johnson, C. S.   | Reg canding and parking machine it maying  | Lauterna, althe and shutter operating device for magic thills id & Nima (Latch dove T M I blanks) (Si Latch dove T M I blanks) (Si Latch dove II W Rivery (Si Latch gate O B Chambern (Si Latch gate O B Chambern (Si Latch A Right) (Si Latch Ar where Richland Nource O B Chambern (Si Latch Ar where Richland Moure) (Si Latch Ar where Richland of the state of  |
| mp, and in doing this he arranges grooves<br>close proximity to the bolt heles so that  | Actor, driving mechanisms drided, of the property of the prope       | Bleetric apparetts, mag with cure for W  | Laten gate O H Chambers Mills Inches Registre Mills Inches  |
| strain of the bolt is exerted almost directly   | Bag fasteur J R Islor 953 196<br>Halley press, cotton, R. A. Withers 953 291<br>Barge cut leading W Yoka 952 291   | Blectric controller, Smith & Larsen 101 Kd. Riectric inst, F Trutt 102 Uni   | Lattic Ar wheel Michiga & Bears Lattic and like unchines adjustable collect for (* F. Schultis 90 Laundry Iron, J. H. Admon 90 Laveling rod G. de la Unas 90   |
| over and upon the outer side of the socket  | Barge coal leading W Yoka 901.224;<br>Barrel hoop C Hoff 901.01.2<br>Basket making machine W F Barnes 902.404  | Electric switch F W Smith 163 851<br>Siertric time switch G I uthi 952,123   | Laureiry Iron, J H Admin 90<br>Leveling rod G de la Prina 90   |
| eiving the bolt head he provides a square   | Bath tab trap wasts and overflow pipe at tachment, D. J Mellotyre Battery holder electric, C T Mason Science and tricking a li Seabert Si Sea  | marcuretti querrinucion system A R. 1105<br>bardi<br>Martiral indicator C Wist 95, 147   | light he Flash light limb artificial J H Hanger line castling machines matrix for J B  |
| rath can be put on the head and cooperate   | Bearing antifriction, L. It Senbert 951 547<br>Bearing coller, J hamaile 952 588   | Kisetruk protector II ( Marrison 161 160)<br>Ricetromagnet R. P. Thrasher 152,000  | Rogers Line clarking device F W Brots 90   |
| the wrench on the nut so as to tighten clamp upon the cables.   | Rell door, W R Moore 9.0,120<br>Bicrele brake controlling device, B. l'edu   | Micrator shaft construction M (abiti Fl 415<br>Elevators, limit step for hydrautic T 8   | I inotype machine R F Wilson 21 inotype machines time controlled beating   |
| TTACHMENT FOR ANVILS. A B.  | Bicycle brake controlling device, B. Pedu casses Billiard one J Bacamile Billiard operating device J Bolowics Billiard operating device, J Bolowics Billiard J T Fortree   | Elevators pronger guids for direct plunger Labout & Rolth  | I hotype mas blees time controlled beating system for A. A Itali I lightly dispensing device II ( Maures 90 I lightly fuel burner t II Please 90   |
| clamp upon the cables. IT TACI MENT FOR ANVILS.—A R. MENTY FOR TOO MENTY TO COMMENT TO C  | Rind slat operating device, J Bolowics 951 955<br>Beard, J T Forms 952,074   | Rungine See Internal combustion engine   | Liquid material apparatus for agitating R  # Towns   Injude sparator F G Epply   District  |
| ch can be operatively positioned on an anvil  | Boats safety device for submariae, W A 052,570 Ribertanta 1 1 Harden 102,570   | Engine controlling auchanism captosive W   | I mak I F Kill Signif St   |
| of the operator using his hands for this  | Roller setting M. II. Chency 952,282<br>Rosk holder, S. G. Rghiau 852,163  | Bogine cylinders couling device for explo-   | linek t C Jackson B.<br>Lizeomediya system rock rail t t trait B.<br>Longitudinally marshi clome of mechanism  |
| rd when not in use  | The content of the co       | F R. Recker Distance of Control o | Longitudingly bureful claimed his factor of for controlling a J till letting r 95 Loops Revelot of & Cowles Loops settemath. William a plantakens til  |
| SUCKIA.—  J. Dours, New York N. Y.  100. as a bot broade there is possibility commentation of the exposed portion. In prevent instance the loofy portion of the sits is formed frees a solid piete, the outer face of which is continuous and adapted to as surface for ornamentation, such as a surface for ornamentation, such as a surface for ornamentation, such as a rariages of initials, embossing, or producing oussel effects.  | Bottle and stopper A. T. Wannerweisch 2012,207   | Sugioes, automatic steering means for plow C A I rise  | Loom automatic filling replenishing Of Jamelle 22, Loom took tourness ware W. Watti D. Loom water beaut Though & Hunter Sec. 226 DA  |
| ornamentation of the exposed portion. In  | Bottle, non-refilable, H S. Cronk MAT SEP<br>Bottle, non refilable, H, O Martin 961,967  | Ragines, operating oil & Higgies Dh.J. dio<br>Engines, throttle operating new haulem for   | Leson warp beaut Bough & Hunter 0-2,226 Dh<br>Lesons apparatus for operating picker me-<br>ther for C Brable 26  |
| present instance the body portion of the  | Bullis and Scholler S Anderth Scholler S Communication of the Communicat       | Patret W J Bullivan 901,850 Pether kolder and unqueri N Fare 21 na   | Mail and the like, everyond carrier for P W Miller   |
| face of which is continuous and adapted to  | Box See Fruit box. Hot opener J Tremblay Box or receptante Kreenkamp & Bowman 802 285 Brake beam C H Williams, Jr 901 881  | Fording device automostic propertional E. 932 114  | Malting or drying grain or the like drum   |
| m a surrace for ornamentation, such an<br>pravings of initials, embousing, or producing   | Brake head for solid beams, reinforced, C<br>R Williams, Jr. 951 861<br>Bread, peptermint, M A Helmer 952,114<br>Brick drylor shed, R H Chilaway 952,250   | Fritze post D 11 Miller S51 1841   | Mask tube drain attachment for J N Regular and the superstant to stable at a   |
| ogmé effects.   | Brick drying shed, B H Callaway 063,270  | Perce waterway stock, B & Tyler 182 (23) Fertiliar distributer T B forram 632 322  | trie B le berre  |
| Honobold Villities.   | Brick, tife, or other articles, ayrantam for baking, gissing or committer L. Honess 602: 100 Bridge, suppression W A Ward Brick, suppression W A Ward Brick, suppression W A Ward Brick, but and brick, b       | Field or beating flask Porger & Amben  | Measuring sporatus liquid is 8 Is us   |
| FOP AND HAUSH HOLDER.—F. Demilies,<br>riand, Ore This holder is adapted to re-  | Brune cutter, W Gilbert 955,512<br>Building block, D. Meintyro 952 (80)  | Filing device for accepts blades, J Mistle 051 201<br>Filing device for accepts blades, J Mistle 051 201   | Merkeling apparatus liquid F 8 Felis Merhankul morem at J 1 Touer Ba Merry go round A B Louis BS   |
| NOP AND BRUSH HOLDER.—F. Duniting,<br>rtland, Ore This boider is adapted to re-<br>re and hold maps, rags, or scrubbing broakes,<br>holder is readily gad quickly adjustable for<br>ding articles of varieus since and characters,  | Cable reel, G S. Lynch 952 146   | D Wheeler 12,2024<br>Fire verspe J Luckett 2018,21   | Metal and glass chaning articles of H 1  |
| nomer is resulty and quickly adjustable for<br>ding articles of various since and characters,   | Chicago machine A Burkbardt 951 962<br>Onlessating machine R. Jahra 962 257  | Fire corage Strein & Meyer 951 157<br>Fire corage Strein & Meyer 951 157<br>Fire conductor defice J (1 Wilson 951 157  | for the manufacture of an improved multir of the themselves or the second control of the |
| ritand, Ore This holder is adapted to re-<br>re and hold mops, may, or serubbing breaker,<br>holder is residity and quickly adjustable for<br>ding articles of various stose and characters,<br>it is sice adapted to maintain an adjustable.<br>I resilisht grasp upon the article used in<br>section therewith.   | Om cover bodder, H M V Leighty 901 916<br>Can slitting mechanism, R. Schilling 902 143<br>One coverled gibt closing implement A R.   | Picture G S. Lewis 952 386   | Metal mold I Mueller 25  |
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Cover

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A TREP IT HER LABBIET RALLOOGY,

(Consissed from goed dec.)

then the she was a miderammer alghir the she was a miderammer alghir the she was derived to resolve the she was destinated an annual to the color of the we called the home of seven hundred thousand souls to be other than a mi-croscopically beautiful toy

"When nearly above the office of the inquirer, we celebrated this occasion by flying our ballast and shooting upward, which turned us mere to the east, and we were above the Delaware, at an altitude of about a mile. Here we wrided the fact that we could see with the naked crow the bottom of the river, and with a very the bottom of the river, and with a ract that we could see with the naked eye the bottom of the river, and with a large spygiaus clearly distinguished the great stones in its bed "Indeed, one of our fellow voyagers in-

sisted upon it that he observed the mo-tions of the fish. Certain it was that the tions of the san. Certain it was that the ripple of the plying steamers was most marked, and then we turned to the ship-ping Having taken a patriotic squint at the Island of Smith, and the still more celebrated Tinicum, we reached the Jersey side at five minutes past six, observing Camdon in all its glory The conserving Camdon in all its glory. The current took us more directly toward the cast, and we for half an hour or more fol-lowed closely the Camdon and Atlantic Rallroad, which could only be distinguished from the turnpikes by the aid of guinout from the turplices by the aid of a glazz. In the moving penorama, the fertile fields of East Jersey formed a most beautiful portion with the Rancoma and Co per's Creek winding anakelike through wee oblong inmissures, distinguished only by the different colors of tinguisance only by the different colors or ripe wheat, growing corn, and other to-kens of peace and plenty Toward the ocean, a bank of cumulus clouds rose up, ocean, a bank or cumulus clouds rose up, and in the west the city was growing dim. We passed over Haddonfield and near Long-a-coming and Waterford, then began to go much higher and faster, havd right through a fleecy clo Beneath us stretched almost interminable pine forests, with the white sand sparkling here and there in they patches We were at this time at the highest alti tude attained during the trip, about three miles, and moving to the east at the rate of at least sixty miles an hour Here the earth appeared convex instead of concave, a phenomenon often observed the spirits of the party became almost as high as the barometric location of their bodies. We individually got up the lad der into the hoop and insisted on a ing songs, which, owing to the rarefaction of the air and the ocho from the balloon, had quite a stentorian effect. At this had quite a steniorian offect. At this point, as we were far above the smoty base surrounding the earth, and also the has possible that the point of the surrounding the surrounding the surrounding the surrounding the surrounding that the surrounding the

surrises and sunsets within the space of minutes The atmosphere, even at our greatest elevation, was not so cold as was scenario, was not so cold as was expected, owing to the rays of the sun being generally refracted from the hazy clouds below The chief physical mani-festation of our situation was in the cars, for when descending from a more rare for when descending from a more rare-fied to a denser atmosphere there was a whiszing, much like that in the diving, and from the same cause. "Although it had been the aeronauts'

intention to reach the ocean, which now was visible, the sails on it being seen by the telescope, yet a delay of two hours occasioned by the vastness of the prepar occasioned by the vastasse of the prepar-ations before starting, limited the time so that it was an alternative to land on a somewhat unimabilite doese without day-light to direct us to a proper spot, or take the back track. The latter course was most prodent in reference to the se-curing of the balloon, said as directing (Onacheded on page 1871.)

# AMERICAN HOMES AND GARDENS

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confidence as nativelestics in which he explains how the concept of the Fourth Discussion quinter substitution is an introduction in which he explains how the concept of the Fourth Discussion quantum substitution presentation, and writing normwise the work that his bean done in the field. He has bee eithed the samps and supplied explained typic features where required.

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(Concluded from page 266) c etter opportunities for its conveyance to

better opportunities for its conveyance to Philadelphia Bo we came down very Last, alled more than was entirely desired by the fulling draw, and the considered by the fulling draw, and the considered by the full draw of the ful

## VERTICAL PHOTOGRAPHY.

(Concluded from page 25f) ground is placed under the giass supporting the article to be photographed. The distance between the support and the background varies from three inches to eighteen inches The greater the distance the less reflection. The color of the place of the color of the object to be photographed. When working under the subject, the light can be reflected under, rendering the background more tense, or on the subject proper, giving not only more illumination but illumination to tillumination of the color of the place of the color of the subject are considered to the color of the subject are considered to the color of the color of the subject are colored to the color of th

that Cameras are manufactured especially for work of this nature and have eaches of measurements so arranged that the ground glass support is part of the camera proper but movable either way with a thumb serve, so that an allowance can be made for objects of various this knesses. By attaching the support of the camera the camera can be made for objects of various this knesses. By attaching the support of the camera the camera can be awaing or revolved during the support of the camera the camera can be supported to the camera can be called the camera may be surpended from a tree-limb.

A stand, such as shown in the illustration, may be easily made and will answer all purposes admirably Any camera can be thus used with good re-

A tilting triped head which is simple in construction and inexpensive in cost, may be used in this style of photography to a good advantage in many cases most pleasing results have been secured by this simple device. A sheet of glass for a background a tilting top for the triped, and the outht is complete

## INTERNAL COMBUSTION PUMP

account of the second of the second of the contradiction of the contradi

turn flow, the column starts to move back toward the pump, and gains veloc ity in this movement until the water reaches the level of the exhaust valve, which it shuts by impact. The result is that a certain quantity of burnt products of combustion becomes imprisoned in the cushion space P and the energy of the moving column is expended in com the moving column is expended in com-pressing this gas combion to a greater pressure than that due to the static head of the water in the clevated tank & T Consequently a second outward move-ment of the column of water takes place. ment or the column of water takes place, and when the water reaches the level of sales be the pressure in the space F is once more atmospheric, and further movement of the water opens valve A. by suction against a light spring, and draws in a fresh gaseous charge If there were no friction the water would fall to the same level as that from which the last upward motion started, but the is slightly less than this movement would represent. Once again the column of water returns under the elevated tank of white returns under the elevated tank pressure and compresses the charge in the combustion chamber which is then ignited at the moment of maximum com-pression, and the same cycle of opera

ignition is timed by a small ap paratus somewhat resombling an ordin ary engine indicator, which closes the electric ignition circuit at the point of maximum compression, an ordinary small battery, trembler coll, and sparking plug as are used in automobile practice

in starting the pump for the first time, compressed air is allowed to flow into the combustion chamber until the volume of air introduced is rather larger than the usual charge. The exhaust valve is then auddenly opened by means of a handlever, and the escape of the compresses air permits a movement of the water col umn, which gives the cushion and suc-tion strokes, and so draws in a fresh com bustible charge, which, when the current is switched on and consequently fired, starts the pump working regularly When the pump is stopped in the usu regular work, it always stops with a fr combustion chamber, so that it is only necessary to switch on the current and the pump is started up. This enables the board and without any preliminarie

ne pump has been severely tested, and is now in regular daily work at a large pumping installation in the Midlands, giving complete satisfaction. The absence of all complicated gearing such as exists in the ordinary explosion motor is an out-standard. the ordinary explosion motor is an out-standing feature, and guards the engine against breakdown, the only part that could fail being possibly a defective mushroom valve or spring Wear and tear is also reduced to an insignifi-cant quantity, and the troubles incidental to labrication are expression. to lubrication are overcome

In its simplest form the apparatus con-verts gas power into hydraulic power, and may, therefore, he called a gas pump, but if the power is to be taken off a rotating if the power is to be tagen in a country shaft, the high pressure water is passed through a water turbine, and so back to the apparatus to be continually circulated. The invention can also be applied with equal facility and efficiency for the com on of air

The pump has been elaborately de-scribed by the inventor in a paper published in the SCIENTIFIC AMERICAN BUT

# RAPID TRANSIT BY RELT CONVEYOR. (Continued from page 287)

with transverse shafts which carry the driving wheels of the platform. The gradation in the rate of speed of the sections of the platform is secured by

varying the diameter of these driv ing wheels, which are a inches in diameter for the 3-mile 16 inches in diameter for the 8-mile, and 24 inches in diameter for the 9-mile platform.

The driving wheels are covered with



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which the trivestication of C.C. Trondstan of Calambia III alteration produced from a vicania their adversarial produced from a vicania their resembles closely: the relification of the last continuous XCIX. The lifestance of Complete of the last continuous transmission and described on the last continuous transmission and described on the last continuous transmission. In 1720, Justices and Press. Illicon about the described on the last continuous transmission. compute of the last century error enumeration and described and modern complany theories statistics about the stargest of honorest bacteria and Psychologische best Company. Qualiforms about the stargest of honoresty bacteria and Psychologische shout Company. Qualiforms about the stargest of honoresty bacteria. Qualiforms about the stargest of honoresty bacteria. Qualiforms are started to the property of the started of the property of the propert

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er, as are the hori guies wheels, and consequently the sick tion of the platform will be both simpoth and sitent. The successive sections are coupled together by means of links 40 inches in length, and the coupling pins are placed at the center, from which the curves of the abutting ends of the plat-form sections are structure. corresponding to spinting east or the pus-form sections are struck, consequently, the opening between the joints may be reduced to a minimum, and a smooth surface presented for walking, with no open spaces to bewilder or trip the pas-

The passenger-carrying capacity be moving platform is just double maximum capacity of the present Sub-way trains. According to the figures of way trains. According to the sigures of the Public Service Commission, the total rush-hour capacity of the firecar local trains per hour is 23,500 and of the eight-car express trains 25,000, whereas the moving platform, according to their estimate, would carry 73,500 passengers per hour They state furthermore that for all distances less than four miles the for all distances less than four miles the moving platform is a quicker and more convenient mode of conveyance than the present local train service and even quicker than the local and express servquicker tann the local and express service combined, since a passenger may reach Times Square Station, from any local station south of Fouriesanth Street (that is, supposing a moving platform were installed on a north and south average and the state of nue) quicker by the moving platform than by the local and express trains of the present Subway

In conclusion, however, we would

sound a note of warning with regard to the possible interference of any moving the possible interpretance of any moving platform subway that may be built with any future extensions of the present Subway In selecting the routs, care should be taken to choose a location where the moving platform subway will not block any of the future through lines which must ultimately be built on practically every avenue in New York

Why Are We Right-Handed; (Concluded from page 261) the lesion on the right side. The hand and arm centers in the brain are inti-mately linked in the cortex with the speech centers. And certainly Crichton Browne is correct in the inference that the preferential use of the right hand and arms in voluntary movements to the leading part taken by the left brain "We could not get rid of our right-handedness, try how we might, it is weven in the brain." And this, I believe, is the conclusion to which we must scientifically arrive "In the curious disscientifically arrive "In the curious dis-ease aphasia, in which one forgets words, the lesion lies in Broca's convolution, one cannot say cup, for example, though one sees a cup, but when the right hand touches the cup, the patient at once ut-

volution, did the heart tend to be on the left side, and the left brain tend to greater development, because the right hand came to be the most used? Or did the right hand come to be most used, the right hand come to be most used, because of these heart and left brain phe-nomena? I am, for my part, of the for-mer opinion; the heart on the left side, and the greater left-brain development, are effect rather than cause, coming gradually to pass as man, in the strug-gia for the survival of the fittest, found right-handedness more and more advan-

trades in which a certain amount of am-bidexterity is essential. For example, trades in which a certain amount of am-bidexterity is essential. For example, the pianist, in playing the fugues of Bach, must produce with the left hand-almost the same tones as does the right, almost the same tonce as does the right, and has to work a little harder too, for the bean notes of the pisace are more thickly wired than the revels. A certain amount of ambidectority is essential in the surgeon. Tet this gift has its disadvantages, withink as when a colleague childed in this way admitted to me that, before doing a thing he weithed appear. time in wondering which hand he d employ. But it is rarely really tial that such ambidestarity be so

Finally, it may be objected, in favor neral education in ambidexterity se one loses his arm, and that such suppose one loses his arm, and that such as unfortunate be a clerk, who must earn his living by writing Such con-tingencies are almost as rare as the famous one by which Mrs. Brown justi fied to her husband her junk-shop pur-chase of a brass sign stamped "John Jones, Undertaker" "Our daughter will acon be of marriagable age, she mor marry an undertaker whose name mor be Jones, possibly John Jones, think how handy the sign will then be" In those rare cases of right handed mutils ion there will in time follow, through education and practice, an adequate de-velopment of the right brain, just as if the unfortunate had been left-handed

## TREATMENT OF STEEL IN

(Concluded from page 262) remains that by doing so Riemer has been able to demonstrate his success in pipe elimination on a considerable and commercial scale. A large number of steel shafts, the steel for which was made by this process and with which the dis card was kept at 10 per cent or less, have successfully passed the British Board of Trade requirements. Indeed, a reference successfully passed the British Board of Trade requirements. Indeed, a reference to Fig 1 shows an ingot, treated by this method, in six transverse slabs on the right and left. The slab shown on the r left hand came from near the top ne ingot The longitudinal slab to of the ingot of the ingot The longitudinal slab to the right of the center of the figure is from another ingot treated by the same hottop procedure. The inconsiderable depth of the pipe seems pretty ovident It extends perhaps 10 per cent of the total length But the actual percentage of steel involved is evidently much less

than 10 per cent of the total

We have in Figs. 2 and 4 two views of the gas furnace There is an eye at the top which facilitates movement of the apparatus. Through two pipes—seen to advantage in Fig 4—the gas and air enter The air is under pressure In cases where it seems desirable to do so the furnace may be employed as a means of heating the top of the mold prepara tory to teeming the steel into it. The then be let down until its lower edge is well inside the mouth of the mold, when the pouring of the steel may be performed without removal of the furnare There is thus ample op-portunity to begin action without delay However, it is regarded as important to have not only prompt application, but an intense heat at once This requirement is met by preheating both gas and air In fact, heat may be applied in such in tensity as to raise the temperature of the sion It has been found unnecessary to prolong the treatment until solidification npleted. This is a favorable item as thus the apparatus is released for as thus the apparatus is released for other service, to which its portable observed has been as the applicable In Fig 4 the furance is in operation heating the head of a 50-ton ingot. It will be understood that in this view the built of the mold is invisible The naked fames play upon the metal at the top of the ingot The prehesting of the top of the mold tends not only to conserve the heat of the molnot only to conserve the neat of the mol-ton steels, but also to prevent heat loss by conduction from the gas flames. The furnace is being used in Fig. 2 for the purpose of preheating However, the in-got is, in this case, said to be present. Now in all procedure for the elimina-

Now in all procedure for the elimina-tion of the pipe, we must not reach final conclusions as to their success without inquiring as to the segregation. The seg-regation is a locality where the steel has an excess of carbon, suiplur, phosphorus, etc., beyond the average contained in the inget as a whole. Ordinarily, it should be removed to the process of the properties of the properties of the process of the properties that got all the properties the inget at little below that point. However, it is wall to inves-



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tigate this question with some thorough ness, as the mothod of treatment itself may, conceivably, introduce variations from the rule Steel of uniform compo-sition is wanted. An ingot cust by the hot-top process was investigated as to its holdop process was investigated as to its composition. The average carbon content should have been 0.25 per cent. By taking samples along the axis all but one were found to contain carbon in percentages running from 0.23 per cent to 0.25 per cent. The viewplon was those under the tail of the pipe. Its carbon percentage was 041 per cent. Similar results were found for sulphur and phos phorus. Thus they existed in the segre-gate in percentages about three and one-half or four times what they did below it.

EGGS OF CURIOUS PORMS.

(Continued from page 43) side the extinct Madagascar bird, the Epyornis, which measured more than thirty inches in its smallest circumfer-

The smallest birds' eggs are those the minute species of humming birds, which are smaller than the eggs of cerwhich are smaller than the eggs of cer-tain kinds of tropical beetles. But file common cuckoo lays the relatively small-est egg. That is to say while the jack-daw and the cuckoo are about equal in size, the formers e.gg is five or six times larger than the latters. The fact that the cuckoo is wont to deposit its eggs in the nests of birds which are unauly much smaller than itself doubtless accounts for this The relatively largest counts for this The relatively largest egg is laid by the kiwl, a strange wing-less New Zealand bird The egg is no less than five inches long, although the ex-treme length of the bird itself is only

twenty-seven inches.
Reptiles eggs are not very attractive objects. In the case of crocodiles and many kinds of tortoises they are palecolored or white, and resemble those of birds in shape. But the egg of the gopher tortoise is remarkable for its comgopuer tortoise is remarkable for the com-plete roundness. It might well be mis-taken for a golf bail' Many anakes eggs are soft skinned, brown as to color, and look for all the world like a number of new potatoes.

new potatoes.

The rggs of fishes are usually small, soft, and inconspicuous. The most remarkable point about them is the extraordinary number laid by the individual A single cod for example lays as many as nine militon eggs. But a strik ing exception to this piscine rule of numerous inconspicuous eggs is seen among the sharks and their allies These "tigers of the sea" lay eggs which are large in size, few as to numbers, and deposited singly instead of in masses. These eggs, of which several examples are shown in the accompanying photos, are known to flaherfolk by such names as 'pixy purses' "fairy purses,' or "mermald's purses," They consist of a dark-colored, loathery envelope, and are usually adorned with frills, horns, or long twisted tendrils. These appendages serve the purpose of keeping the egg case sup-ported among the branches of seawerds, thus preserving the cubryo from the damage it would sustain were the damage it would sustain were would sustain were worker by

Amphibians-frogs newts, and the like —lay fish-like eggs without exception The Surinam toad, however, has a remarkable way of dealing with the eggs when they are laid. The male takes the eggs one by one, and imbeds them in the eggs one by one, and imbees them in the actt skin of the female s back, each egg in a separate cell liere the eggs re-main being carried about by the female until the young toads hatch. There may until the young toads hatch. There may cells in the back of a single individual although from sixty to seventy is the ore common number

The egg laying habits of the "midwife" frog of Europe are almost equally curi ous. The eggs are deposited by the fe-male in the form of long chains which may be upward of a yard and a haif in length These chains are taken by the male and wound around his legs and (Concluded on page 270)

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Classified Advertisements thighs. Thus requipped, he retires to a Assentiates in this souther him is been sensed. Committee to the bank of the stream, where he has not her seed to the life him to the stream, where he made is not the seed to the s poles are on the point of hatching. Then poles are on the point or naccing. Than he enters the water, when his off-spring emorge from the eggs, and wriggle away to take care of themselves. On the seashore, after rough weather

may often be seen an object which bears no small resemblance to a cluster of purple grapes. This is a mass of cuttle fish eggs—that strange, eight-armed mol-lusk which disports itself in the waves to the undoing of such marine creatures as are unlucky enough to come within grasp of its suckers. Each "sea grape" is produced with a flexible stalk, by means of which it is joined to its fellows, the whole mass being fixed to some stationary object, such as a rock or stone But like the eggs of so many marine creatures, the eggs of the cutt at the mercy of the elements, and in times of tempest they are often torn from their moorings, and cast bruised or broken upon the shore.

Near relatives of the outtle are snails and shellfish of many kinds, and among this great group of animals' eggs so many strange forms are found that a many strange forms are found that a description of them would fill a bulky volume Many of the large land smalls produce hard-shelled eggs; differing little in appearance from those of birds. An example is the West Indian Bulissus, shown in the annexed photograph, to-gether with its white, clongated egg But the egg cluster of the common whelk (Bucrinum) is like a rather dingy honeycomb, partially squeezed between hands. When the eggs are alive hands. When the eggs are allve and healthy, the form of the young whelks can pisinly be seen through the semi-transparent unstance which envelops them. Another quaint form of molluscan egg is that produced by the turnet shellfish (Twrretrile) The eggs are joined together like a number of small beeds on a fexible cord

If the eggs of mollusks are varied in If the eggs of mollusks are varied in appearance, the eggs of insects are infinitely more so. Moreover, many of them are marvelously beautiful in form and embellishment. This beauty is almost always hidden from the eye unatided by the microscope, for the eggs of most insects are more specks, often aided by the introceope, for the general color most insects are more specia, often less bulker than our first of and the second of most insects are mere specks, often ar oggs and by the minute ansects which spend their whole lives among the feath-ers of birds. These minute beings pass under the unsavory title of "lice" Yet under the unaxory title or "lice" is their eggs, when magnified, exhibit as amusing diversity of form and a beauty quite fairy like They are among the most popular of microscepic objects.

In conclusion it may be said that cer tain insects deposit their eggs in clus ters which bear no little rese muts or fruit Such is the case with the "rear-horses" (Mentide) and their allies. Possibly this resemblance may be of importance in protecting these eggs from the attacks of insectiverous birds and

Cosmets Expected in 1910.
The present year promises to be past iteniarly rich in comets. Four comets those of Winnecke, Daniel thousery rich in comets. Four comets, those of Winnecke, Daniel, Halley, and Inness, have been or are already visible. Inness's comet, which was veryightight appeared suddenly, it will be recalled in the midst of a recent auroral display

## Home-Made **Experimental Apparatus**

AN ELECTRIC CHIME AND HOW IT MAY ME COMPTROUTED AT HOME, is described to THE CONSTRUCTION OF AN ELECTRIC TREMMOSTAT is explained in Scientific Ameri-TOUR TO MAKE A 160-MILE WIRE! A K.H.P. ALTERNATING OVERHELT DE THE COMMITMUTTON OF A SIMPLE PRO-TOGRAPHIC AND MICHO-PROTOGRAPHIC APPARATUS IS SIMPLY VARIABLES TO TOGRAPHIC

A STRUCT CAMERA SECTION OF A PASTEROARD BOX, PT SUBER BARD is the subject of Scientific American Secretarion 1

AF EASILY MADE RICH PRES PARATUS WRICH CAM BE US TAILS RITHER D'ARRONVAL OR I RENTE IN SMORTHMEN IN BRIGHT REPUT IN CAP BE TO RECOVER OF THE PARTIES OF THE PA

MPLE WINKING TRINGRAPH STRUMS described in Brientiše American Supple-nts 1888 and 1881. THE LOCATION AND EXECUTION OF A 100-INLE WHELESS TELEGRAPH STATION is learly explained, with the help of diagrams, a Scientific Assertant Stanton THE MANING AND THE UNI-PRESENT TRIBURATE TURING Hostrated with diagrams, Scientific corplement 1674.

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A REWING-MACRINE MOTOR OF STREET,

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at Mannesburg. In addition to the four, peven periodic comets are expect to return in 1910. Probably not all of comets will be visible, b will be unfavorably situated with re to the sun at the time of perihelion pas-sage. The expected comets are the fol-lowing '1 Giacobini's comet, 1896 V I sowing I discount's comet, 1899 v it was first thought that this comet would reach its perihelion about the middle of February, but later calculations have proved that it really passed its periheproven that it really passed its perilie-lion last December It has not yet been seen and, as its position is very unfavor-able, it may escape observation alto-gethor. 2 Swift's comet, 1895 II This comet was not seen at its return in 1902 and unless its orbit has been consider ably changed, the conditions for its observation will be still less favorable this year it should have passed its perihe-lion about the end of January, and should then have been almost exactly behind the sun 3 The second periodic comet of Tempel should reach its perihe-lion about February 21st unless its orbit has been greatly changed since 1904 has been greatly changed since 1894, when the concet was last seen. The conditions for observing this conset in its periled properties of the control of the to unfavorable conditions 'rms year,
if its orbit is not changed, it will reach
its perihelion in October Its position
then will be very favorable for observa tion, so that this comet will probably be visible next summer 5 Spitalers comet 1890 VII escaped detection at its visits in 1897 and 1903, because of poor condi-tions for observation Dr Hopfer, of Trieste, has shown that the orbit of this comet has been greatly altered by per-turbations caused by the influence of Jupiter between 1890 and 1903. In consequence of these perturbations, the perifrom 6 42 years to 6 82 years. The comet should pass its perihelion in October, 1910, in conditions favorable to its redis-covery 6 Fayo's comet is also expected return in the latter part of October conditions favorable for observation In conditions rayorable for observation.

7 Brooks's comet, 1889 V, is expected to reach its perihelion in the summer of 1911 but it will probably be discovered during the coming summer.

Moving Picture Royaltics, The moving-picture industry is on a distinctly theatrical basis. It has its "trust," its theaters where actors play before a camera, its scene shifters, its supernumeraries, its property men, and a whole theatrical staff more or less simi lar to that of the regular theater. The "trust" in question was formed about a year ago by a number of manufacturers of films under the title of the Motion Pictures. Patents. Company. Patents, chiefly those of Thomas A. Edison, were pooled, and active steps were taken to purge the moving picture theater of some of the more objectionable pictures which have brought down a hail of criticism upon the industry, to license the movingpicture theater to use the apparatus and exhibit pictures, and to control the in-dustry in general There were many inexhibit pictures, and to control the in-dustry in general. There were many in-dependent manufacturers who refused to pay royalties or to acknowledge the patent rights of the Motion Pictures Patpacear rigue or the section recurser rate can be company. A suit was recently brought by the company against Carl Learnine, a well-known manufacturer, and the Independent Moving Picture Company of America, of which he is president, as well as the Pantograph Company to the company of the com president, as well as the Pantograph Com-pany, to restrain the alleged further in-fringement of Edison patents controlled by the Motion Pictures Patents Company. Inaumuch as the patents in question had already been adjudicated and their va lidity upheld, an injunction was granted The hearing brought out some ver-steresting statistics, which will undoubt

edly open the eyes of the gener (Concluded on page 272.)



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## SPARK COILS

Their Construction Simply Explained Scientific American Supplement describes the making of a 116-feek grank

1887 describes a season spars non non content of the content of th

(Concluded from page 210) ns that every day some four

or five million persons attend the thir-teen thousand moving picture shows of the United States. The pictures which flicker on the screen before the spectators are projected by means of appara-tus, the basic patents of which were taken out by Thomas A Edison These four or five million persons, therefore unwittingly pay royalty to Mr Edison whenever they hand in their nickels of their dimes at the box office. It is stated that about 1,440,000 feet of film are mad that about 1,440,000 feet of film are made by the members of the Motion Pictures Patents Company On this production a royalty of half a cent per foot is paid to Mr Edison, so that his revenue from the moving picture-loving public amounts

The action was brought by the vic-tion Pictures Patents Company to re-strain infringement, but the defense set strain infringement, but the detense set up was that the company violated the Sherman antitrust law The decision handed down by Judge Noyes of the United States Circuit Court was that the question at issue was patent infringe ment and not violation of the anti-trust law, for which reason he granted the injunction

The Brennan Mono-rall ( ar. successful demonstration was given recently at New Brompton, of the Bren nan mono-rail car At the trial an Mi-horse power generating set was working The trials commenced with running the vehicle loaded with packing-cases, round the circular track of 105 feet radius at a speed approaching 20 miles an hour The stability of the car under these condi-tions was apparently all that could be tions was apparently all that could be wished, the schiele canting over several degrees toward the center of the circle of track. This demonstration was followed by an exhibition of the facilities afforded by such a car for unloading. The vehicle was intentionally titled over our to chocks on the right-band side and some seven unloaded. It was then Kerosene Oil Engines

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On David Register of the Control complete circuits of the one-eighth of a mile track were made with each load During these runs we timed several During these runs we three new several rounds at speeds of between 18 and 20 miles an hour The motion on board was quite pleasant the vehicle riding very well The inward cant that the vehicle acquires when traveling on curves at

high speed naturally added to rather than detracted from the comfort of the

passengers Altogether some 300 persons had an opportunity of being on the car riages under these novel conditions The riages under tuese novel conditions rise demonstration which followed showed the ability of the vehicle to take sharp curves, this, however, revealing nothing more than was evident from the earlier trial toward the close of last year. The

carriage, with passengers on board, was high a speed as was practicable along the straight with perfect success. The slight lateral awaying under these condi-

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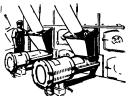




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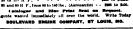
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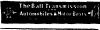
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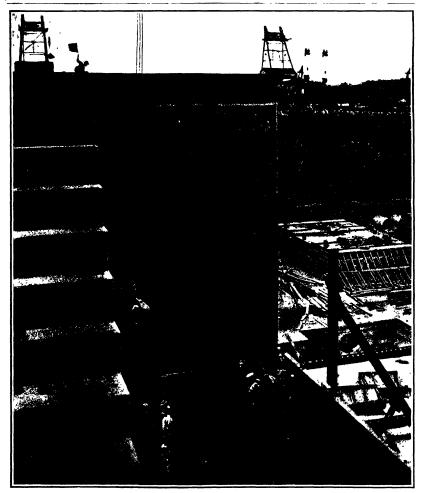






# A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. (18 - No. 14. )
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| Brillians 105 | NEW YORK, APRIL 2 1910 | 10 (FATS A COPY A SAME PRODUCTION OF THE PRODUCTION



The skie walls, \$500 feet long, are built in sections between plate skeel forms. To the right of the compacted wall is seen the interior face of a steel form with the form for the end of the section upon which the men are at work extending tennerously. In the pecket they formed the seen are showing and tamping the will concrete

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NEW YORK, SATERDAY APRIL 2nd, 1910

The Fixer is always girl to Province for examination illustrated actuals at the second of time ty interest. If the photographs are object, the articles and the facing and leading the contributions will province appeals attending. According to the contribution of the THE PARAMA CANAL AS AN INVESTMENT

ONSIDERABLE doubt is being expr Just now as to whether the Panama Canal will prove to be commercially a paying investment and in a series of articles, which have recently been published Admiral Evans, proceeding slong several rather formidable lines of argument, is apt to leave, at the first reading, a de-pressing conviction that this great national undertak

ig can never be self supporting.
On the other hand, there is the fact that other go cm care orner nana, there is the fact that other great canals, such as that at Sucz and the one which has made Manchester a seaport, were, during their construction, the subject of similar dismal foreland ings Yet Suez has proved to be one of the most profitable commercial undertakings in the history of the world and the Manchester enterprise, in spite of the few lean years of its carlier op ration is now ac-

complishing all and more than was promised

It is well to remember, moreover that the admirals presentable with a full reference between creatin trade-cuties; in the two sends and he assumes that unde-cuties; in the two sends and he assumes that under-the distances righ Pannan are aborter than those over the present routes, the new saterway will be power-less to divert existing trade from ills present lines of sailing. Now although the principle as here laid down is breadly overed; it should not be forgottu pessimistic view of the future is based much a comthat the connecting of the two great oceans is certain to materially affect the trade conditions along the stretch of both the Atlantic and Pacific scap of North and South America. Indeed, the cutting of the canal may so calarge the trade and importance of certain of the maritime cities as to render it expedient for shipping which at present uses the Suex Canal route to take the longer route by way of the Panama Canal

But we should judge of the value of the Panama Const rather from the military than the commercial point of view—a fact which is well understood at dington where undoubtedly it acted as t pelling motive in urging Congress to undertake this stup alons work. That 14 000 mile trip of the battle-ship Oregon during the Spanish was was an object beson, the significance of which has maker been for-gotten. The opening of the canal will render the whole naval force of the United States available in of ther ocean In its ability to strike a rapid and declaive blow at any threatened is int along the whole of the Unite! States seaboard the efficiency of our fleet will be practically doubled, and the fact that the whole may can in a few weeks time be assembled in the Pacific Ocean will enormously increase the mayal prestign of the United States in the Orient and must inevitably tend to preserve the peace in those great Oriental questions which begin to loom so large great Oriental questions which begin to toom so targe on the diplomatic horizon. So long as the lathmus of Panuma, exists as a barrier between the Atlantic and the Pacific we must build at least three battlevilus where others so we would build two, and the first cost of construction and the heavy cost of maintenance and operation will far exceed any temporary or even permanent deficit which may develop in the operation the caust as a commercial venture

Meanwhile under the administration of that most efficient holls, the Corps of Engineers of the United States Army the accution of the work is proceeding Blates Army the averation of the work is proceeding with a rapidity which is in pleasing contrast to the confusion and disempointment which marked the carrier warm of American occupancy and in the series of striking illustrations of the work which we present in the present lesion, we are enabled by our readers an adequate impression of the magnitude and solidity of the permanents works, the most mon-

### RELATIVE REPAIRS ON MANY-BUILT AND CONTRACT-BUILT SHIPS.

HE wisdom of the policy of building at least a small portion of the new ships of the navy at our leading navy yards has been and is yet a question upon which there is much Jet a question upon which tore is much division of opinion. The principal argument in favor of this policy is that it becomes possible to maintain an adequate force of skilled mechanics permanently at the yards, and avoids that disastrous breaking up of the organization and scattering of forces which oc-curs in the slack season when the annual repairs upon the ships are completed and they have sailed for the summer maneuvers. The maintenance of a permanent force increases efficiency and insures that pernament force increases emerency and maures man the leading yards will be in a position to meet at once the heavy strain which would be thrown upon them in the event of sudden hostilities. Of equal impor-ance to the question of the effect of new construction in maintaining a permanent force in the navy yards is in maintaining a permanent force in the navy yards is that of the character of the work that they can turn out Conclusive data upon this subject are furnished by those two sister ships the 'Connecticut' and the Louisians the first built at the New York pary yard, and the latter by the Newport News Shipbuild ing Company If certain disabilities under which the navybuilt ship labored, due to slowness in the delivery of armor and the fact that she required special fittings as a flagship be considered, the time and cost of construction may be regarded as approximately the same as those of the ship built by contract.

As to the question of the relative quality of the work done, there is no surer test of this than the amount of repairs which have been made upon each vessel in the four years that they have been in commission. The following figures, taken from the report of the Paymaster-General of the Navy are very conclusive on this point. In 1906, their first year of service, the repairs on the "Connecticut cost \$236 97, and on the Louisiana \$5,-09 In 1907 the repairs on the 'Connecticut' ounted to \$53,557 47, and on the 'Louisiana' to \$99, 851 09 851 09, and the totals up to the end of the fiscal year 1909 were, for the navy built ship \$111,833 58 and for the contract built vessel, \$149 167

In view of the fact that during these four years the cost of the repairs for the Connecticut' was about it per cent less than that of the Louisiana" what beof the oftrepeated statement that our )ards are incapable of turning out work of the same high quality as that of our private yards?

## THE REED OF AN IMPROVED PARCELS POST

HM existing restricted parcels post system of the United States Post Office, as established by Congress in 1874 has so far limited the disc between manufacturers and consumers that it is making the United States appear to be wonderfully behind the times as compared with some foreign us Germany It is a fact to-day that an American in England can send home by mall to any part of the i nited States a parcel weighing two and one half times more than the United States limit for about one-third less in cost than the present bone rates more time the three states limit for about one-three less in cost than the present bone rates in other words the world possal union package unit is elevan pounds to the parcel at the rate of twelve cents her pound. Whereas the little distates unit is only four pounds to the package at a cost of sixteen cents to the pound. The parcel rate in the United States prior to and early in 1874 was eight cents per pound for a package limited to a weight of four pounds. After that the rate was doubled, but the weight remained the same. Since 1874 the cost of transportation has greatly decreased. The question is, transportation has greatly decreased. The question is, why should not the public through its representatives in Congress be given the benefit of this decrease by the establishment of a uniform low postal rate for parrels that will encourage the use of the Post Office. as a medium of exchange of commodities, and thus

Since the experimental introduction of the Rural Free Delivery system in this country, its operation has proved so great a necessity, convenience and success that Congress overlooks the annual deficit arising from the unreasonable restriction placed in the law limit ing the kind of postal matter to be carried to letters, newspapers, and periodicals. The weight of this aver-age load is ascertained to be but twenty-five pounds while the vehicle which the postal agent is required to supply can readily carry two hundred pounds it is estimated that should the restriction be removed and parcels be carried, even allowing only one or two parcels per trip, enough revenue would be re-ceived from the additional postage to more than pay the total cost of this system, and make it sell aupporting

A movement in this direction is the intro A movement in this direction is the introduction of a bill before Congress, prepared by the Postal Progress League known as the Bennett Rural Parcel Post Bill. now in the House Postal Committee, which provides

for very moderate postal local rates along a between the city or town and places in the country It would enable the merchants mercial center to send, may on telephone of es directly to the purchaser living on and would promote the exchange of merch tween the residents themselves on the rout as their sending products to the commercial the service would be somewhat similar to that of 6 usual postal railway coach and its collection and dis tribution of mail matter
With the extension of good roads and the use of

with the extension of good rosas and the use or rapid automobiles, a longer route could be established than now exists, as a maximum distance, which would reduce the number of vehicles required and econo-nise the cost of maintenance

In this connection the experience of the use of the mail automobiles in London is worthy of note. At the second annual dinner of the Royal Automobile and the sociated Clubs of London in the summer of 1909, Henry Norman in a speech alluded to the success all automobile as a time and money saver is the mail automobile as a time and money saver is the transportation of mails, by saying that in the sity there were thirteen local motor services averaging thirty two miles a day. There were also ten sets at services in and out three times a day between Landon e principal towns on the outskirts of the city. In the thirteen long-distance night automobile mail coach services a saving of \$300,000 a year was ef-fected as compared with the horse service which did the same work only a few months before. The Len-ton Post Office is now operating no less than sixty f these motor services. Results of this casracter certainly show that the of the

establishment of a very low posts; rate for parcels is feasible since it will treate more than sufficient revenue to pay the cost, besides saving money for the mer-

ant and consumer
It is to be hoped that Congress will give such intelligent consideration to all matters relating to postal improvement that the system, so useful and necessary to the people, will forthwith be placed upon a sound busi-

### HYDRAULIC TURBINE REDUCTION GRAD

T N the leave of the SUPPTIFE ADMILAY of February 12th of the present year, we described the turbine reduction gear designed by McFarland and McAlpine in which a mechanical gearing is in terposed on the shafting between the turbine and the represent on the anathing between the turnine and the propoller, for the purpose of reducing the secondical high speed of the former to the relatively low so-nomical speed of the latter, and it was noted that a nechanical officiency of UKS per cent had been secured in the shop tests. Simultaneously with the development of this gear, the problem was attacked by Dr. H. Fottinger who, with the assistance of the Vulcan Works at Settin, has produced a reduction gear which substitutes for the toothed gear of the McFarland system a set of hydraulic turbines through which a b of water is kept in constant circulation, and by th proper proportioning of whose buckets and channel ways the desired reduction of speed is secured. A complete description of this good with libratrations is on in the current issue of the Supresurar to which given in the current issue of the Stoyrs surver to which reference is made for fuller details than are here given. The turbine shart and propeller shaft are in-puted to the state of the state of the state of the pump, which delivers its water into the backets of a vater wheel which is mounted rigidly upon the pri-poller shaft, and it will be soldent that by selecting the proper relative dimensions of the two members, and the desired ratio of speed between turbins and pro-peller can be obtained in its simplest form the re-ceived and the state of the addition where when the state of the state o a driven water wheel, but in the larger powers one or more intermediate wheels would be interposed be-tween the pump and the driven wheel, indeed transformers with one or more stages are preferable when a considerable reduction of speed is desired. With a reduction ratio of between 1 to 4 and 1 to 6 uring two reduction stages, an efficiency of from 80 to 83 per cent is secured. This seems low when compared with the 885 per cent efficiency of the McParland gar, but the Cerman system has the advantage to it is readily reversible. The system has been tried on a small vessel of 175 teas, which has been driven by a 500-horse-power turbins at a speed of between 13 and 13 knots. When the reversing lever was thrown over at full speed, the propoller shaft came to a standish of the standard a reversed speed of between 300 and 150 revelletions. Similar to the shade, if would seem that the German, because on the standard of the shade, if would seem that the German, because can system on ships that make long continuous versars. On channel and river steamers and for tugs and small vessels it has some advantages. with the 985 per cent efficiency of the McF

Asbestine, for Fireproof Costings.—Prepare a paste-like mass of asbestos, powdered silios, caustic potash, and soda-water glass. To be buyned and sand mixed

### Scientific American

## MENGINEERING.

atlastic record has been broken, which reduced the min dependent of 1,859 miles by 36 minutes, the minutes of 7,859 miles by 36 minutes. The minutes of 1,859 miles by 36 minutes, and 19 minutes of 1,851 miles by 36 minutes. The minutes of 1,851 minutes of 1,851

members of the steel or as a protection to use in the event of collision was demonstrated was a subsection of the collision o

Armshine serve of Cassiere, states editorially that the Mark Statistic section of the Statistic server of the Statistic server

when haval constructor, basing his deductions the room Frnnch manewer, believes that the hoffsy separatise will be a "submersible destroyer of \$1 knobs surface and 15 knots submerged speed, of subject radius of action to accompany the main face on lang cruises. He believes that the greater the region of action and the higher cruster in the column of the column of the column of the column and the column of the column of the column of the column membrater instrument of oftense and defense

Some, tasks of the offect of superheating recently made on the American yach. 'Indian' show striking remains. When using saturated steam, the consumpting, of water per indicated horse-power was 18 spenses. This was reduced to 17 pounds, with 176 degrees superheat, 18 spounds, with 98 degrees at 18, pounds, with 98 degrees superheat, 18, pounds, with 98 degrees superheat, the boiles as wrings of Topic states the state of the state

divisors of the Public Service Commission, relating to the dibryl of passanger trains in New York State of the State of th

and appropriate which is being tried on the Hudson and Annhantan Railroud tunned reprine hencetch the Musican River will be wetched with much interest by bodd the railrounds and the public It consists in literatured and the public It consists in literatured railrous signs, placed inside the cars, which are no streamed that the guard by pressing a button white the trail as starts, rings a bell and causes the signs to display the name of the next station. This signs 'quadelines' to be displayed until the train leaves the 'statistic designated A simple device this, whose utilities are observed to be consistent of 'self-statisty designated A simple device this, whose utilities are observed to be a simple device this, whose utilities are observed to be consistent of 'self-statisty designated A simple device this, whose utilities are observed to be consistent of 'self-statisty designated A simple device this, whose utilities are observed to be consistent of 'self-statisty designated A simple device this problem."

A elimination of engineers and scientists is making an interest in the study of the cause of the revent flood in Farth, preparatory to devising a system of protection of the farth, proper and protection of the farth of the committee will be to devise a pain for keeping the revenues of the farth of the committee will be to devise a pain for keeping the revenue waters committee with the same although the provides within the health of the provides of a health of the same time the commission will interest the same time the commission will never seem to be a same time the commission will never revenue the travelous the various public services, including surface and subway lines and the sewer, gas, electricity telegrabs, and telephone systems which were affected by the inundation, with the object of remedying the defects which were developed during the flood.

defects which were developed curing the flood. The work of providing adequate coast fortifications has been carried to the point at which they may now be considered to be very complete, at least as followed the complete of the control of the complete of the

### ELECTRICITY

As the Glidden four this year will pass through territory where the telephone and telegraph service is very poor, it has been decided to equip the care with wireless telegraph apparatus. This will make it possible to keep in close touch with the contestants, and the latter will be able to report accidents and call for heln when pacessary

In plants which use a gas engine to drive their generators the variations in good of the engines are not noticeable if carbon filament lamps are used, because the filament is quite thick and does not respond quickly enough to above any fluctuations in light With tungen filaments the light waverings are very annoying, and gas-engine manufacturers have from it in recomany to equit heir engines with heavier

A convenient method of determining variations in the candicepower of a lamy was described in a recent number of Elektrotechnische Zeitschritt. A selentum cell is employed, which is exposed to the lamp under test and to placed in series with a recording milliammeter. The curve recorded by the milliammeter, which is due to the variable resistances of the selen tim cell, indicates the variation of the cardicepower of the lamp. To be sure, this does not give an accurate photometric measurement.

Take photometric measurement.

A large servicion of land has been bought by the Commonwealth Edison Company in the northwester part of Chicago, where two large sometring stations are to be built. Back hatton will be equipped with of each turbine will be \$0.000 hore-power. It is a carbine and in the first station the capacity of each turbine will be \$0.000 hore-power. It is a carbon to be a superstance of the company of the company has doubted error three years for the last twolve years.

Chicago is trying a new car designed to remove city garbage over the street rallways at night. The car is of steel construction, 'th' feel long divided into three sections which are so shaped that they can be dumped with a jobe by a single man thus foing away with the necessity of using air cylinders or other mechanical dumping appearatur. The sections are very garbage. The car is not provided with motors It is intended to use the car in the daytime for haul ing concrete and construction materials

A novel method of recovering a sunken cargo has been adopted by the United States Revel Company A large maguet, 3½ foct in diameter and weighting 3000 pounds, has been employed in raising kegs of nalls from a berge that was sunk in the Mississipple River man New Orleans. The magnet raised five or alix keps at a time, or about a ton at each 101. The advantage of this method was such as that it avoided the king open the kegs as would have been the case had a dredge been need. The magnet is soon to be used for maining a sunken load of ween wire, and also for a load of state halling at the load of ween wire, and also for a load of state balling strips.

Several years ago the Illinois traction system decided to use sleeping cars between Springfield and East 81 Louis As this system has proved a success reveral more cars have been ordered for use between St. Louis and Puoria. Those cars will differ from the first ones in having no motor equipment. They will be trailers and it is expected that a good deal of the amonying vibration of the lists dear will have been come. The cars will be if feet long and will be provided to the state of the state of

The following subjects will be taken up at the International Congress of Telephone and Telegraph Engineers, which is to meet at Paris this year (1) that are the second of the second of

### SCIENCE.

Mr. E. E. Clayton, late of the Biue Hill Observatory, has gone to fluence Ayres to organize kite and balloon observations under the direction of the Argontino Meteorological Service

Mant Angström, professor of physics at the University of Upsala, died Marrh 4th. He was distinguished as an investigator of solar radiation, and 'evised the instrument adopted by international agreement as the standard for measuring this element, viz., the Augström electric compensation pyrheliometer.

The International Meteorological Committee, which assembles triennially, will hold its next sessions in Berlin during the last week of September 1510 Dr W N Shaw, director of the British Meteorological Office, is president of the committee and Prof Dr G Hollmann, director of the Royal Prussian Meteorological Institute hererotary

The standard trop round of the Philodelphia Mina was revently besided by the Bureau of Standards and found to be slightly over weight, because of the act to the slightly over weight, because of the act to slightly over weight, because of the was certified to by the bureau officials in a report to the Direct or the Mint I. twas shown that when the weighting took place the temperature of the sint was 22 degree, the relative bumidity was 69 per cent, the bareneter was 154 millimeters the mean density of standards was 84 at 21 degr. C The weight variation of acts was 64 at 21 degr. C The weight variation area was 64 at 21 degr. C The could be sufficiently of the sint was the sufficient to the sint of the sint overweight to everweight to everweight to everweight to everweight to the sint of the slight overweight.

The Flore bust controversy will not die. De Goorge Pithus the well-known German chemist analyzed the wax in the famous bust and found if to be a combination of lat, apermaced; and beewexx. Allegind and the permanent was unknown until 1700, he argues that apermanent was unknown until 1700, he argues that the bust could not have been lat Vinit. Furthermore, he proved that the composition is identical with made the bust. De fine still manimates that the least is a genuine Da Vinit! He replier that Prof. Rathon mades very and analyzes and found that the wax of the bust was different from that used by Lucas and Dr Podes opinion Dr Pilmus analyzed only part of the outer layer of the wax which Lucas added Morrovers, Dr Bode quoter Prof. Lippunan of Italic Taiversity as authority for the statement that the first opinion of the profession of the Carlovian of the Carlovian of the Carlovian of the Carlovian of the Mediterronance countries at the beginning of the statement ventury despite the belief in some quarrers that it was not known until 1700.

At the invitation of the Ro hester Chamber of Commerce and the Civil Improvement Committee of that sity the conference of 190 will be held at Rochesture May 2nd to 41th American cities are being around to the necessity for a city plan, and for the proven ton of congestion of population Many rities have plans others are getting them a few are following hearn out they it is imprestive to adopt a city plan is becoming secondary in practical importance to how the city plan once adopted on a best be carried out. The purpose of the conference this year is not per unity to continue the ramping or education nor to increase the literature which makes up the already explicit around the theory of the conference is a guitarring of current and these but the conference is a guitarring of current and the conference is a culturing of current and the conference is a culturing of the scheece of the planning. On corrulties will be most carcifully avoided. The aim will be to discuss phases of such elected subject throughly rather than to wander through the whole field.

Prof. Pierre Royada, an architect of Huenos Ayres has devised a special plan for the construction of whole districts of houses for the working clauses and the second professional states of employing the usual squares hiok as a unit, Prof. Royada adopts a circle varying in dissouer from 100 to 130 yards. This circle of ground is subdivided into 90 radial ion converging to a venter. The irremarks are not being the professional to the contract of the contract of the contract of the contract of the contract and selection and transverse streets. In the center of the circle is a pilot of 40 radia in dismeter where children may be left to themselves without their parents' care, in charge of a specially designated person in this garden a playroom a zebod, a hospital, a five station, and an administration room are to be found. Naturally this administration room are to be found. Naturally this in each of these corracts Prof. Royada intends to exclude the contract of the product of the profession of the profession of the continued on a cooperative plan in oach of the 99 radial plots a workingman's house is to be built on the Emplish and 11 the aggregated that the circular arrangement will give continuous smakine at all bours of the day and plenty of light and air.

# NEW TYPE OF TORPEDO BO.

## A DOUBLE-HULLED BOAT WITH ITS ENGINES ENTIRELY BELOW THE WATERLINE

A new type of war vessel provided for by Congress in the Vaval Appropriation Act of last year will be officially tested by the United States government at Bost in within a few days. It is known as the sub-surfa a torpe to boat and is designed to be immune from the small gun fire now relied upon as a pr tion against ordinary torougo bosts It consists of a s hmarine hull which contains all the machinery and terms of armament suspended from an unsinkable sur hull divided into compartments packed with

c liul se Last years law authorizes the purchase of this bout when the official trial shows that it fills requirements and the constrution under con tract of two ath rs of the same ty; Ite boat has had a prelim inary trial Tans Lemoine & Cra tle onseiting architects t; ri that it easily n 16 18 knots ite boat has had a prelim ) ir thus exceeding the re-quir d speed by 2 knots Bix tons is the weight of the ves-

sel and its length is 46 feet The irie which the government has agi ed to pay in \$22500. The small subsurfa o boats can either be used for coast defense or they n: be arried on board of the larger vessels in an armored flext in time of a tien they can be launched and directed by day or night against the enemys fleet night against tre enemys neet particularly for of ratte ne against ships lying under the protection of land (criffications or mine fields where expensive latticables should not be risked as

they were at Mantla Santiago and Fort Arthur

e hull of the new style boat is an eight cylinder gasoline engine of 1.0 horse-power eignt (yinner gasoline engine of 1.0 horse-power The explosive charge (arried for use on hostile vessals is 1000 pounds of gunction An armored counts tower on th surface hull communicating with the subnarire h il cashies the natignt r tr direct and control the boat a movements. Only two men are re-

It is estimated that a fleet of fifty of these sub-It is estimated that a net of fifty of these sub-surface torpodo boats will cost about as much as two or three destroyers or submarines. As their cruis ing radius is 200 miles their principal fun tion will probably be for the defense of ports and unguarded coast line

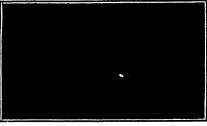
surface boat is to be operated in one ways I ither it may be steered within short torpedo range and aimed at its objective the crew leaving it in lifeboats or buoys or it may be fitted with a sub erged bow torpedo tube to discharge the ordinary

For the firing of the high explosive use is made of an electrical firing cir uit which is actuated by a bow firing pin but which is kept open and safe by a switch in the coming tower until the boat is deserted. It is also projected to continue the firing oir uit around the inner skir of the upper hull below the water line so as to explode the charge if the boat should be rammed, and thus deter hostile boats from ramming. Also it is proposed to use on the engine sparking circuit a time switch whi h will automatically break the sparking circuit and stop the engine and boat if it misses its

The total government appropriation for boats of this

type is \$445 000 When the first is approved the Navy

type is \$445.000. When the first is approved the Navy, Department is authorised to contract for two others, one more of the same size and one larger and faster—a \$400.000 subsurface seagoing destroyer. A year or two ago the Amistant Secretary of the Navy recommended the building of a number of small motor torpede beais of approximately the same size as this to be laid up on shore in peace time for one sional practice runs by the naval reserve and for use by them in case of boutilities. The boats proximately were to be of 17% knots speed which is somewhat less



THE SUBSURVACE TORPEDO BOAT OF ITS TRIAL TRIP

than has been achieved by the present subsurface bost on its preliminary trials

The English motor torpedo boats built by Yarrow

The English motor torpedo boats built by Yarrow with Napier engines make about 18 knots. They are of about the same size as the vessel we are describing and are used for the same purposes. It would appear therefore that no speed has been lost by carrying the engines and torpedo below instead of within the built with the same purposes. engines and torpedo below instead of within the hall of the boat It is suggested that in view of the comparatively small expense several flottline of these boats could be distributed issog our coasts and laid up with the vergious greated in which condition the expenses of the several condition of the comparative that the naries of the world are just now directing special situation to substrace warkers and the trials of this boat which of form some decidedly valuable features in the great process that the complete will be watched with no little interest. On the comparative will be watched with no little interest can be used to be comparative will be watched with no little interest.

due to Clarence L. Burger CE of New York and the plans (alculations etc were made by the Naval Architects Tams Lemoine & Crane

The Olds

The Others Aside Locker

A little leaden tablet tarnished ugly and otherwise
trivial in appearance was sent a few years ago from
Athena to the imperial Museum of Berlin On one
side of it is some writing which only recently was
deciphered with precise correctness by Adolph Wilhelm
an Austrian content with lives in Athena. The tablet deciphered with precise correctness by Adolph Wilhelm an Austrian scorest who lives in Athens. The tablet is the original of a private letter that was written about the time of the orator Demosthenes The writer of the letter lived in a rural neighborhood

The form of the address was 10 or memory polary matter and to be handed to Namida, er & Thrapkies or to the son (perhaps the son et effect where we have the son to other thair predoce and and the son to other thair predoce and wares for rais may be imaginate as in progress. These the boy who was bearer of the latter was to find the sender or both of one of the three presents when the predoce and the sender when the sender was beared on the sender when the sender was the sender when the sender was the sender when the sender was the sender was the sender when the sender was the sender was the sender when the sender was the sender when the sender was the sender was the sender when the sender was the sender was the sender when the sender was the sender when the sender was the sender was the sender when the sender was the sender when the sender was the sender was the sender was the sender when the sender was the To be taken to d the boy who was bearer of the letter was to find the stand or booth of one of the three persons to whom it was addressed and deliver it to him. The text of the liter mays Muestergoes greets you cordisily his-greets your family with the same esteem and wishes

with the same esteem and wishes, them good health, and be mys abso-that his own health is good... Please be no kind as to send was a, mantle either of sheepskin or of goatskin and let it be as cheep to possible for it does not need to he possible for it does not need to he rimmed with fur Send with it a pair of heavy soles also As seen as I have an opportunity I will

pay you. So much for the letter to the motive of which the reader can point with as much precision as the author Apparently it was the author Apparently it was written in winter poor Mnesterges having been surprised out in the open country by one of these key snowstorms which sometimes even at this day cover the temples of at one may cover the temples of the Acropolis with a mantle of mow Therefore he desired to re-ceive as quirxly as possible the heavy and warm garment of the

heavy and warm garment of the poorer countryme a greater which could be longht for four and a half drachman and the strong soles which were worn under these and the strong soles which were worn under the editary sandais on the rural plains and hillsides A good pair of the latter could be longht for feer drachman as a well preserved bill of that date shows. A notworthy feature of this arthus letter formula with which it begins the very formula that may be found used in very numerous festions that one preserved by the Greek literature of later times. Even at the present day every letter virtue to we at the present day every letter virtue to we at the present of the country o preserved by the Greek literature of letter times. News at the present day every letter written by a rural Greek begins with the same cordial inquiry about the health of the person to whom the letter is written and with brief information about the health of the

Although it is possible to resolve into gas almost any kind of solid fuel in a gas producer it is well known that certain fuels—particularly those high in ash and of a caking character—give a good deal of rouble. One of the most serious of these troubles states a contemporary is that the fuel welds thatf into a large mass which partially chokes the first in the content of the content of the content of the content of the first in the content of the first in a local content of the content of the first in measure and the nonreson obtained of the first in measure and the nonreson obtained of the first in measure and the nonreson obtained. sary and the poorer the fuel the more the poining in order to reduce this poking to a minimum some In order to reduce this poking to a minimum some prodocer makers it shaking or revolving greats. The latest design of this character is due to lift Character and it is a considerable extension of the principle. The lower portion of the produces of the principle. The lower portion of the produces of divided into two or three rings which are free of such other and rotate at different speech to justice between them being make by water seals. The object is to shake the true (ontinuously so that caking or obgiging out about new results) impossible.



This little craft, 48 feet 8 inches long queries its war hand and engines in a me filled with polisions, to designed to be unsintable. In attacking the og the heat would be defren at the aparter at the fall spinel of til Spinel action and bearing the beat to eligibely his change of (LIS) passage of a

# TRACKEESS ELECTRIC TROLLEY-DRAWN SLEIGH IN NORWAY

## BY FRANK C. PERKINS

inchervice during the past win-

The nevel construction of the trackless trolley car

resultation.

This-pared construction of the trackions trolley out of the she Discussed to the trackions trolley out of the she Discussed to the trackions trolley out of the Ribertshee as paished it appeals on the Ribertshee India of the Ribertsh

hore-spower capacity is utilised, which affects the tractions tribley car at a normal speed of about 30 kilosenters (1245 miles) appear of about 30 kilosenters (1245 miles) noted that the canada-power each it will be noted that the trulley pads is similar in those noted that the trulley pads is similar in those noted that the trulley pads is similar in those of American construction, but provided with two conductors and constant of or the similar parts of the trulley when instead of the usual single trolley when

Bvery winter the demand for fresh eggs becomes more instatent and more difficult to supply Poultry breeders in different parts of the world have en

deavored to supply the deficiency by artificial selection. By this process an Australian breed of fowls which averages 270 eggs per hen per year has already been produced. A series of very interesting experiments on the same subject has been carried on during ments on the same sunject has been carries on suring the past ten years at Macdonald College, in Montreal, which is reputed to be the most perfectly equipped school of agriculture in America. Starting with breeds noted for their endurance of cold, especially



A PASSESCER SLEIGE DRAWS BY A TRACELESS ELECTRIC TROLLEY

Plymonth Rocks and White Wyandottes the experi rymonom noces and wante washnottes the experi-menters began the process of selection by allowing the fowls to leave the poultry yard and a ratch in the anow in the coldest weather. The prograpy of the fowls which availed themselves of this privilege was subjected to similar treatment which was continued for several generations. The poultry houses were not heated, even when the temperature fell to ze Fahrenheit, although the fowls were slightly protect from the cold by screens placed around their perchas The poultry yards were covered with a layer of straw

a foot thick, upon which wheat or millet, the only food a foot thick, upon which wheat or millet, the only food given, was strewn at regular hours. The hens were kept busy from morning until night in hunting for their food in the strew. This active exercise pre-vented the accumulation of fat and stimulated the production of eggs, for every poultry farmer knows that fat hens are poor layers. Hence, as hens, like all other birds, naturally store up fat at the approach of winter, the problem became limited to preventing this ac-

cumulation of fat, and at the same time as swring to the hens an abundance of food The problem appears to be in a fair way of solution for the hens of Macdonald College produce an average of 300 eggs per year, from one-fifth to one-fourth of which are laid during the rigors of the Canadian

The removal of ashes by conveying them to a waste bank hydraulically is done in connection with the temporary plant built to supply power during the construction of the Rainbow Falls hydro-electric develop ment of the Great Falls Water Power and Townsite Company on the Missouri River near Great Falls Mont The power house is on the side of a hill directly above the edge of the river bank. The bituminous coal of the river bank. The bituminous coal used is dumped by gravity from cars on a trestie to a bin at the rear of the firing floor of the boiler room and runs down on this floor, from which it is fed by hand to

the furnaces As the sakes fail through the concerds the they are drawn out into a innaverse concerds lined trench in the firing floor. This trench is aloped to one side of the building, where it connects with a funne extending on a grade of about 5 per cent to the odde of the river bank. When the grades are cleaned the sakes are pulled into the trench and a lose stream turned into the latter to start them. They are thus picked up by and carried out in the river through the flume No difficulty is experienced from clogging in the trench or flume and the current in

# THE EARLIEST STORY OF THE DELUGE

## PROF. HILPRECHT'S REMARKABLE DISCOVERY

other onsection version that far manythad.

The work of Fred Hilprocht is of the commentation of the Nipur tables. Spot valid to the Nipur tables. Spot valid to the total process of the commentation of the Nipur Index Spot valid to the Uv of the Challege?

These Fred Rifferent's recom-mentation that my discoveries be made accordable to the attention would as quickly as penalties, as pages by his has recently been published by the University of the University of Pannaylynas.

A "Office" Burlyonian Expedition
integral-writery of Passany'rania. Series D; Resign and Treaties. Vol. V Passiculos." Prom
'giber for hollowing abstract is made:

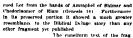
"Office to the passion of the University of Passanyi
Burth aspectition of the University of Passanyi
to hippor, Prof. Ettipepake transition was about to hope to the passion of the p of the country. This fragment was so completely



PROBE AND ROOM VIEWS OF THE MIPPUR VERMON OF THE DRIVOR.

BATE, APPROXIMATELY, SIGN R. C.

Series D: Retifection." From subsection of the series of to uncorer one cuneurum and other deposits of hard-ened drift without damaging the writing below, until its had completely deciphered every sign. The frag-ment proved to be a somewhat incomplete but unmis-tabable second of the Delugs about 1800 years under think sheller fragments obtained from the library of shifterhangal (684458 B C) and was inscribed more than 1805 years before the time generally assigned to Release, and even before the Patriarch Abraham re-



ment contains a portion of the di Nosh Ill us plabtim to construct a ship and to save life from the all destroying flood Apart from the tradition of a great flood handed down by the Babylonian priest Berosus (living between 3'10 and 250 B C) but preserved only in ex tracts by other ancient wr there are fragments of three writers tinct Deluge versions in cuneiform

The first of these is the version from the library of King Ashur banapal (668-626 B C) which was restored from a number of frag veh, and which is an Assyrian copy

of a Babylonian original
The second is a somewhat dif forest version of the Babylonian Deluge story and is found on Fragment "D(ally) T(r)egraph)

42," which likewise came from the royal library of Ninevoh and was inscribed about the same time (c 850 B C)

The third fragment is that acquired and published The third fragment as that acquired and pusinents by Prof Scholl of Paris, and now in the possession of Mr J Pierpout Morgan It is dated "in the year when King Ammi-adduga built Dur-Ammi sadiuga at the mouth of the Euphraties," i e, the eleventh year of his government, in other words, according to Prof Hilprocht's reduced chronology, about 1968 B, C.

As examination of the cuneif fragment and a comparison of this new version of



the Babylonian Deluge story with the parallel pas-sages of the two Nineveh versions and the Biblical story have brought out the significant fact that, with due allowance for a general resemblance b the three cuneiform versions, the Nippur version of the divine announcement of a great flood and the command to build the ark differs fundamentally from the two Ninevah versions and agrees most remark-ably with the Biblical story This agreement affects that part of the Pentateuch (Gen 6 13-20 8 11) which Old Testament critics style P (= Priestly Code) and generally regard as having been "compiled in Babyionia about 500 B C" The importance of this new text to theological students cannot be overrated Written as it was about 2100 B C, this new version came into being at a time when the sanctuary of Enili at Nippur was supreme among the Babylonian temples and was the center of Hersture When Hammurabi, the Amraphel of Genesis 14 conquered Rim-Bin of Larse, the various petty Habylonian states con site of Larsa, the various petry starpionian states con-stituting accomplically the ancient kingdom of Shu mer and Akkad were united politically by the con-queror Babyion on the kuphrates became the ma-tropolis of the united empire. After Ammi-ditans the third successor of Hammurah Nippur disappears implify from history. It respicars with the rise of third successor of Hammurahi Nippur disappears rapibly from thistor I frespients with the rise of the Casaite dynasty in Babylonia about 1400 B C, and its sanctuary again rises to hold a completion place for several centuries. The revival is but the last flicker of a fast dying flame

In Prof Hilprechts opinion the Temple Library at Manue was a most insignificant institution after Nippur was a most insignmean institution street 1909 B C, and it indurshed most giorlously before 2000 B C. The priests of the Cassite and Neo-Rabylonian periods produced few, if any original literary com-positions of value at Nippur

mere delighting in the stateent at the end of their tab lets that the text was "a faithful copy of an old Nip-pur original". The literary activity of the priests was transferred to other centers like Rabyion and Sippar is therefore evident that the dippur fragments, antedating the two Nineveh versions by 1500 years, represent the old est version of the Babylonian Deluge story in a Semitic translation, made doubtless from a much older Sumerian original which has not yet been discovered and that the been discovered and that the later cunciform versions are different editions of the same story with consider-able changes, abhreviations, and additions The Doluge story of the so-called "Priost by Code" pust form user of ly Code" must form part of the oldest traditions of Is-tael as Old Testament schol eve pointed out

Even the Amarna period ut 1400 B C) with its nditions in Pales

tine, when the influence of Babylonia upon the shaptime, when the influence of Embylonia upon the snap-ing of the government and the religious conceptions of Palentine was almost all cannot explain its pres-ence in the Old Testament. The only period when the oldest version of the Deluge story could possibly have entered Cansan was the time when Abrabam, whom Prof Hilprecht regards as an historical per sonage, left his home on the Kuphrates and journeyed westward, in other words, the period of the first dy nasties of Isin and Babylon of which Hammurahi or Amraphel is the central figure, the time when the Amorites knocked at the gates of Babylonia, invaded ne country, and soon overthrew the old dominion Although the interpretation of the Nippur tablet

is by no means easy it can be stated with safety that in accordance with the exalted position held by Emili in the old Babylonian pantheon as "father of the it was in all probability Enill himself who warned Ut na-pishtin to take refuge in an ark Here then as in the Diblical version, the Lord of the Universe himself both causes the Deluge and saves Nonh from destruction by warning him and ordering the truction of an ark

present herewith in parallel columns the translation of the actual preserved portions of the ancient Nippur version and the corresponding passages of the Old Testament according to the Rebrew text. similarity is at once arriving so much so in fact that the blanks in the Nippur version can easily be supnifed by the more complete account

Line 1 will looses."



'it shall sweep (or 6,11 "behold, I will deillier (?) before the de-age consoth forth 'as many as-bero are, I will bring user brow, destruction annibila 18 "but with thee I will stabilish my covenant" 17 and briefeld I do remarks my covenant "
7 and brief I do
bring the delays upon the
caria to destroy all feels,
wherein is the breath of life,
from under beaven, every
thing that is on carth shall
perish

d build a great ship and"
7 'total beight shall be
a structure" N 'it shall be a nonne-beat earrying what has been saved of like with a strong roof over

10 (the boat) which thou shalt make 11 'Instead of a r

was nere, pury small be male and female:

200 (two) from the birds from the birds for a number berred.

Instead of a number berred (two) from everything creeping on the ground instead of a number thereof.

IN b wand thou shall come also have a seen and the way the seen and the seen and the seen and the way the seen and the seen 12 and family"

The Current Supples

The current Supplement, No 1787, contains a most er of interesting articles. Karlerns ble numb Knatz writes on the modern use of police dogs, and Raymond on quantitative and qualitative think ing. Prof R. S Woodworth deals interestingly with the 'typical" man a creature who does not exist, but yet who is very necessary in the endeavor to classify

four world's records last fall upon the Brooklands track in England, and so it is not to be wondered at that

THE SOO-HORSE-POWER BENE RACER IN WHICH OLDFIELD MADE 196 00 MILES AN HOUR. A NEW WORLD'S RECORD

mankind A prominent place among the physical agents employed in modern methods of therapeuties has been occupied for the past decade by light and especially by electric light, which is used chiefly in the form of "light baths" and is furnished by are and incandescent lamps separately or in combination Dr Theodor Schueler reviews these modern thera peutic agents in an article entitled 'Electricity and Light in Modern Medicine' No name is more distinguished among modern astronomers than that of Prof G E. Hale, the foremost authority in the world Prof G E, Hais, the foremost authority in the world on the sun He contributes a brilliant article on solar vortices and magnetic fields, in which he critically discusses recent solar investigations, and effect in sun-post in a circuit resultant solar effect in sun-post in a circuit research, as in less ambitious affairs, the possession of a good imagina tion is often of the utmost value. There are reliable to the form of the sun of the sun in the ing schievements, there are equally few in which the authors of these advances have not owed a large measure of their success to the happy inspiration of their imaginations, all of which is discussed in an article entitled "Scientific Guesswork." Although the port of Swansea is piaced on the banks of the River Tawe, it may for all practical purposes be regarded entirely as an artificial port, the discharge of the river being trifling an compared with the volume of tidal water obbing and flowing between the pierheads. The peculiar conditions of that port have more the construction of a most wonderful dock, pos a water area of 5 acres in addition to the area the desp-water extension which, when it is on will add 40 acres to the total. This remarkship

is described by C Van Langumdelenh CC-L, & Blavettwrites on modern divelopment in Valley, distributions write on modern divelopment in Valley, distribution value of the contract and the contract and the contract and the contract the contract of modelenthen may be considered, but there is also nouse which when contract managered in more fertile of rescales in theorem, the considered in more fertile of creation in theorem, the current with the terrest har C B Guillaumn's excellent article satisfact the contract of the co fact that sorwe propellers are most deficient at a raise of speed on-literably lower than the rate of speed which is best for efficiency and accounty of turbine operation. To overcome these drawbacks Dr fi. Peetinger has invented a system for which be claimed to the control of the course of the control of the course of the control of the course of the cour aimple hydraulic transmission device, the socturbo-transformer G H Bryan contributes some ideas on the subject of aeroplane stability

NEW AUTOMOBILE RECORDS AT ORNORD BE wagain the famous sands of Ormond Beach have en used for making new rec ds with auto been used for making new records with automomies. During the three days' meet held isst week Barray; Oldfield once more beat the world's record for appear with his new 200-horse-power Bens rance, a picture of which is reproduced herewith. This may

> upon the smooth sands of Ormend it traveled two miles in the fastest time ever made by an automobile The distance was covered in 55 87/100
> seconds, which is nearly three
> seconds better than the record
> of 58 4/5 made by Demogeot of 08 4/0 mage up beam in 1906 with a Darraco The rate of speed trai by Oldfield 1s 1 128 89 leld **alb**o miles an hour Oldfield also made new records for the kilometer and the mile; covered the \$,280 feet of the first-mentioned distance 174/100 seconds. The pre-vious record was 1776/100 His record for the mile, which was made a week previously, was 27 38/100 sec-onds, a speed of 131 72 miles Walter Christle's front-drive ra r covered this distance in 20 29/100 seconds or at the rate of 118 46 miles

In the stock car races, Old

field made a new record of 40 35/100 seconds for one mile in a Knox machine. This make 4 car also won the 10-mile free-for-all in 8 41/100 minutes, a Chalmers 40horse-power car took second place, the 10-mile handi-cap was also won by a Chalmers car, which best the Pope-Hartford, the time being 12 minutes and 12 seconds. On the last day of the most, in the one-mile speed trials, Oldfield covered the distance in 27 88/100 The 10-mile stock chassis race for cars hav seconds. The 10-mile stock chassis race for cars having a piston displacement of 161 to 230 inches was won by Hart in a Buick in 12 minutes and 58 seconds, or at the rate of 46 27 miles per hour A Hud-son machine came in second In the 10-mile handicap a Darracq car driven by Kiracher wom in 7 21, Oldfield on a Knox was second and Bond on a Stears third. A second 10-mile handicap race was won by Altman on a Hudson in 12 45, Oldfield with a Ka

was again second, and Kirscher third.

In the one-mile speed trials the Darracq covered the distance in 37.24, and Walter Christic made it is 88.15.

While the races this year were not very numerous, idfield created a great deal of enthusiasm by him record-breaking driving, and it is probable that next year still other attempts will be made to reduce the time for short distances. The machine Oldfield used fa for short distances. The machine Oldfeld used fa the every way similar to a regular stock car except, that it has a much larger engine of 188 x 300 millimeters (7.3 x 7.8 inches hore and stroke, capable of developing considerably more than its rated horse-power.

A large portion of the old French plant at Panama was found to be serviceable, and is doing good work on the canal. Since 1906 the undess punk has been sold as evrap, and up to January, 1910, even ten they used tone have been shapped spid and.

## Scientific American

delly during the past few years the structure Meanishily during the past for years the structure and impressed the historic of the starts have been an other of the limit here of the such when an other of limit here is the start of the limit here are not a hour or start of the here have been an other to the hereal of the start hy means of which may be investigated all the states of the globe, which as they monest one another lowered its center indicate an interesting to another lowered its center indicate an excreasing temperature in controller to the proper said of daymen. As indicate further vivid importance to the discountion, the glot of certain chapter of Dr W I. Meyer's book, "Reworks Weller", and with it has busied the fanny both of the discountion, the glot of certain chapter of Dr W I. Meyer's book, "Reworks Weller", and the discountion of the temperature of the creat of the earth and of the interior volume of the will be a start of the cart has the follows on the temperature of the creat of the cart had been dependent on the start of the cart of the cart had been dependent on the start of the cart of the cart. With increasing depth the degree of heat is substituted. In many holes the degree of heat is substituted to the cart of the car

region meters of greater digits are added. This reside is due to the mode of ameration that include part of the characteristics of two bilometers. haddedth part, of the distance toward the con-ter it the earth. Here at this depth a tempera-ture of 50 deg was as-certained. If this manner of calculation be continued for greater degrees of depth the im-mediate result is that siready at 60 kilometers, approximately, the con-stituents of the crust of situants of the crust of the earth are in fary so-lution, and at 300 kilo-maters must be in the form of gas. The latest investigations conducted by Mayer remind us of the research of Tanuman and others and of the results of experiments made to measure the results of experiments made to measure the speed of the progress of waves of seismic disturbance. The collective result leads to the conclusion that the real first crust of the earth cannot be specifically thicker than 100 kilometers. Among the phenomenes scuttaining this complusion is the so-

meters. Among she phegorçans sustaining this conclusion is the soconfider segam which is core to other confider of the segament shad the distance afterness to superficient and the state of the state of the segament shad the distance afterness to such as the segament shad the imperature of the center of the sate of the chirch like between 20,000 and 100,000 deg 
at this presents. Dr. Meyer seeks to satisfy the departs of the settle of the segation of the settle of the settle segation of safe fifth at course between the search and the sensy it he store of heat, great beyond brame continuous settle store of heat, great brame to conless, engage is so far counterbalanced by the heat imseried; it was earth by the rays of the sunt that of
species and the mean temperature of the surface of
the jumit sun he accordanced it must be noted therefore, tight as on the temperature of the earth depend
the point important processes of life, there are assurely for an indefinite time at least.

An Braption of Rina

On March Mith the Sicilian volcano Stns began to erent. The lava united in a vast stream 24 feet high 1,200 feet wide, and at the time of going to prese threatening the destruction of Belpasso and

Bereilo. The lava devastated large tracts of cuitivated lands, such as vineyards and orchards, and has wrought haven in the woods. The village of Nidolo, near Nico-del, has been covered completely, and many huts and height deven have been destroyed.

BUILDING THE NUCE CONCRETE LOCKS AT GATUE, PARAMA. SPECIAL APPLIANCES BY WHICH THIS BUOK ANTIFICIAL

MONOLITH, 400 PEET WIDE, 4,000 PEET LONG, AND 90 TO 100 PRET DEEP, IS CONSTRUCTED

50 to 100 Peer next, is constructors.

The work at Phannan, and particularly at the great flight of double locks at Gatun, has now reached a stage at which the camera is able to catch some adquate impression of the titanic proportions of the work and record it for the interest of the outside world. We have all understood that the scale upon which work was being done at Phannan was impressively and the particular that the p sive, but it remains for the accompanying pictures to teach us just how stupendous is the mass of masonry which is slowly taking shape near the Atlantic end of the canal.

The locks at Gatun will pass vessels up or down The locks at Gatun will pass vessels up or down between sea level and the lovel of the lake which will be formed by the great Gatun dam immediately ad joining the locks. The total height of 85 feet will be covered in three flights of approximately 28 feet be covered in three flights of approximately 25 for each, in order to provide ample accommodation for each in the control of the control of the against total disablement of the locks, they are being built in duplicate, as aboven in the plans herewith presented Each lock will be 10 feet wide, and will have a unable length of 1,000 feet. To provide against the carrying away of gates and the consequent rush of water out of the lake the former will be built in mum of 18 to a maximum of 22 feet, the size varying according to the number of side culverts that are served. Now it can readily be understood that the coat of a work of this kind, involving the handling of 4,000,000 cubic yards of material, depends very largely upon the amount of labor involved For it works of this character the cost of labor is the prin works of this character has cont about is the jirit clipal item, and honce much thought has been given to the design of the appliances for handling of concrete and the huge "forms (temporary in losing walls) within which the concrete is deposited. At the Gatun locks the sand and stone are deposited. the Gatum locks the sand and stone are deposited from cars in a stock pile running parallel with the lock site. On either bank above the buge excavation of in which the locks are being built are a series of lufty style towers (see front page and Pine. 2 and 7), which the buckets containing the materials are trans-ported The converted spitched up by these calles run over the excavation and lowered at the desired point. The first part of the concrete work consisted in the laying of the huge slab of concrete, 392 feet wide

and nearly 4,000 feet long, with a maximum thickn of 20 feet, which forms the floor of the locks. Dur-ing the construction of this floor, care was taken to provide circular transverse conduits with vertical openings through the floor which led alternately to opposite side walls, there to connect with the main longitudinal, emptying and filling conduits. The next task was to erect the side

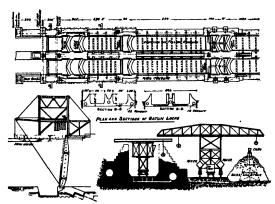
walls, and it is this in-teresting work which is shown so clearly in the accompanying tion

The walls are built in sections, each of which is about 40 feet with, with a space of about 30 feet between them ? The by filling in the interven-

ing vertical gaps
It is well understood that one of the most ex pensive elements in con crete construction is the building and manipula-tion of the forms in which the concrete at a lin smaller structures these are composed of timber, but because of the huge amount that would be required and the big depresiation in the value of the timber after use this material was altogether out of the question The plan adopted is shown very clearly in our illustra The forms are tions The forms are built entirely of steel (Figs 2, 4 and 5) Those for the inner ver-tical face of the walls consist of a series of massive steel towers of triangular cross-sec-

a triangular crosses to the vertical face of which is riveted wall of size plating, stiffened by horizontal channel irons. The towers are carried upon four 4 who i trucks, two under the front and two under the rear fare, which run upon two pairs of rails laid on the floor of the lock and parallel with its longitudinal axis. The rear face of the walls, which is stepped, by a series of separate rectangular measuring about 6 feet on the vertical and 4 feet on measuring about 8 feet on the vertical and 4 feet on the horizontal face. The ends of each wall section are closed by means of sirel plates supported against vortical movable framework. Into the pocket as thus formed the concrete is dumped from the akips of the overhead cable, and tamped into place by the labor ers, until the full 6 feet of height corresponding to the height of the rear stepping is completed walls are thus carried up three at a time until they have reached their full height. This work is very clearly shown in the front page engraving, where a skip is shown as having just delivered its load and the laborers are spreading and tamping the concrete To amist in making a firm joint between the mono to maint it making a nim joint petween the mone-lithic sections, vertical and horizontal key ways or pockets (Fig. 5) are formed in the abutting faces, which pockets are, of course, filled in with concrete wasen pockets are, of course, filled in with concrete as the intervening gaps between the walls are built up. This system of keying, coupled with the natural adhesion of the concrete, will prevent any tendency to cracking or separation of the walls at these points under hydraulic or earth pressure or under the rack ing strains of an earthquake shock

A most interesting piece of steel form work is that



per-exciton of emergency date in the tion, with wicket girders down an gates partly in the lowered pos

Diagram showing method of building the locks — Sand and stone are lifted from the stock pile to the mixers, and from the mixers the concrete is carried to the lock side by the two cantilever grains

How the 4,000,000 cubic yards of concrete are being mixed and built into place at the Canal locks. BUILDING THE HUGE CONCRETE LOCKS AT GATUR, PARAMA

duplicate, with a considerable space of water bet them, so that if a ship, overrunning, should strike the first gate, the second will remain intact. Also, at the estimate to the upper lock, there will be a huge swing bridge which, in the event of the gates being carried away, can be swung scross the lock entrance, and a series of horizontal, vertically sild catrance, and a series of horizontal, vertically sile ing steel gates lowered down from the bridge, thus effectually shutting off the flow of water. Heavy fender chains will also protect the gates by receiv ing the first shock of a collision and thus, partially

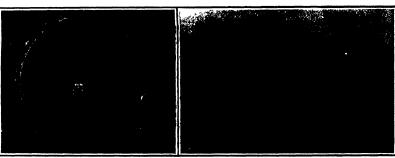
if not altogether, absorbing the momentum.

But the present story is concerned with the methods which have been adopted for building this huge monolithic, or unjointed, mass of artificial masonry, into the construction of which will enter about four monolithe, or unjested, mass of artificial masonly into the construction of which will state about four million cubic yards of concrete in general, the locks may be described as consisting of a floor, 400 feet by 3,500 feet in area, and of 25 feet maximum control of the contr for forming the 18 to 22 foot conduits in the side walls. It consists of a flexible steel pipe (Fig. 1) heavily braced to reside deformation, which has a longitudinal hinge at the top and at the bottom is provided with heavy left and right serves by which the form is found to 10.00 ft. the serves by which province with heavy left and right serves by which the form is kept to list full dimension during, the lay-ing and setting of the concrete. For remove the forms, the serves are turned and the bottom edges of the forms are drawn togs ther thus reds in it, the dimneter and allowing, the form to be drawn clear of the

conduit
A most interesting picture is Fig. 3 showing the work at the entrance to the locks from Gatun dam. Forther that it is seen the rear stepping of the easterly

wall of the easterly lock. The circular timber work shows the position of the upper end of the first lock. Just beyond this are two sections of the steel forms for the main central conduit by which water will be led from the lake to the upper lock. Just beyond the wall which extends across the picture to the right-hand bank will be located the emergency dam above hand bank will be located the emergency cam above referred to, and beyond that will extend the three plers which will form the lock entrance from the lake. The embankment which will be seen running out as an extension of the natural bank to the right out as an extension of the institute south to the picture is the rock fill forming the south-crly toe of the great Gatun dam, which extends to the right across the valley to a junction with the

distant bills. The lake of wining usen so the right of the rock embankment is (epined by the hydraulic dredges which are being using in making the Gatten dam. Half a mile to the nagrib, also extending across the valley from the northerly and of the locks, a similar rock fill, and hung dredges are now engaged in pumping silt and water From the Chagras and from the various contiguesse channels, into the high beain half a mile wide and over a mile long the beain half a mile wide and over a mile long the locking the first firs

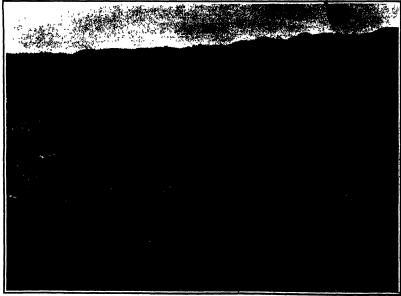


The condults are formed in the body of the side and center walls. The forms consist of collegeble steel cylinders, himsel at the top split at the bottom and kept in place by tiggright and left screws. The latter are lossened when the concrete has set, allowing the two halves of the cylinder to swing inwardly and be withdrawn.

Fig 1 An 18-foot conduct, for emptying and filling the locks

Looking into the middle look excevation from the cost bank. To the left, action of side well with forms per in place. In contex of excevation, the middle wall is builty built in sections. To the right in a side wall exciton showing the mortable form in place and a norther or the track upon which it is transported

Fig. 2 -General view of middle lock



In foreground is the timber form for upper end of apper lock. In center of stapped wall are the stant forms for co will calcul everal feet into Lake Gaton. To the right is the reck fill which forms the some pamped up from the Chappen to form admit for filling the looks. Beyond the wall will be the emergency date and the entrance place, which ters too of the Gaten dam. Rock of it are the water and nit, which have been

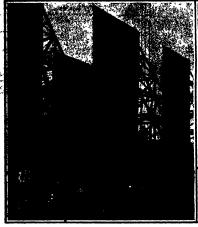
Fig. 8 -General view of south and of Gatan looks

## Scientific American

looking at this picture, fairly depict the scene as it will appear when the canal is completed, supposing, of course, the side wall were broken away to give me as the control of the course, the side wall were broken away to give me as the look and the course of the look in the course of the look by will see the three concrete piers extending the cuit into a vast lake of water which will complete the course of the space now occupied by tracks, telegraph lines and embankments, and will extend in an unbrush, and will extend in an unbrush course outfill it reaches the hills in the far distance.

Efficiency of Bioma. Tarbine Resides,
Bone experiments upon steam turbine nozate, expanding steam from ordinary boller pressures to
conficiency researce, are described in a paper presented to the American Society of Mechanical longneers by Prof Silbery and T. R. Kemble I he main
results are worth noting, and contirm the tiskins
made for the efficiency of noxists by turbine masers
Efficiences of from 50 to 56 per cent were regularly
obtained. The actual discharge from the nozzie,

stated as a percentage of the theoretical discharge, was of the same order as the efficienties Most in teresting however, was the appearent lack of influ ence exerted by the form of the nozzie even when this might have been expected to be considerable, as in final no. The the section changed from it cular at the neck to square at the discharge or when a conical needle protruded into the norse from the late and Smoothness of surface was, however, an important factor



This is a completed so than 6 the middle lock side wall. It is 80 feat with by N feet high. In the base is one of the main filling and supplying cooluits. The vertical recesses are to sorted in keying the section together.

Fig 4,-Steel forms in place for building center wall.

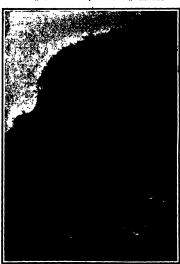


Fig. 6.—Portion of concrete core wall, Mirafleren dam.

This wall, earned down everywhere to self- rock, will earn to pr



The gaps will be filled with concrete, keyed and comented firmly in place, thus providing a continuous monohithic wall. The steel angle plate forms are already set up across the further gap Fig 7 -Sections of easterly side wall, upper lock

# HE HEAVENS IN APR 🍱

BY HENRY NORRIS RUSSELL PH.D.



HE great comet which was so con apknous in January is again observable in the morning sky, just before daylight but only with telescopic aid Its orbit is now well determined and it appears that it was nearest the sun, at a distance of 10,000,000 miles, about the time of its greatest brightness, and that its

and fading was due to its steady recession from both earth and sun its orbit is probably very nearly parabolic. That it could not be of short period was clear at the time of discovery for so bright an object could not have escaped being seen often before, if it had come around at moderate intervals like Hailey's comet

The latter is invisible behind the sun during the early part of April, but is well placed for morning the

time it appears almost stationary in the heavens south of the eastern edge of the great square of P gasus and is high crough to be observed befrom 158,000,000 miles on the 1st to 77,000,000 on the 70th, and its apparent size and brightness will stead-ily increase. By the end of the month it will doubtless be conspicuous to the naked eye

While waiting for this, we will find abundant occupation among the stars. Hefore we trace out the constellations into which the imagination has grouped them, let us study a real family of stars, whose relationship has but

recently been discovered
It has already been told in these columns how Prof Boss has identified about forty members of a group of stars in Taurus which are keeping toother in their mo through space like a flock

of wild gross in the air It has also been know for some time that five of the bright stars of Great Boar form a similar group, and recently, through the studies of two German astronomers, Lu-dendorff of Potsdam and Hermprung of Göttingen, it has been found that several other conspicuous the sky, also belong to it.

(se say, asso belong to it. All these stars are really moving in the same direction, and at the same rate, and hence they all appear to be moving away from the same point in the heavens, though in quite different directions, for some pass our system on one side and some on another. They our system on one side and some on another They cought on this hypothesis still to be approaching us, and the stretrescepe shows that this is actually the case the observed velocities of approach agreeing cleanty with those predicted by theory. The stars of this system are shown on our map First come the group in Uras Major—the stars S, 4, can(4, all in the Orest Dippro—with Airs P, the A; can(4, all in the Orest Dippro—with Airs P, the A; can(4, all in the Orest Dippro—with Airs P, the A; can(5, all in the Ore

\$\ a\$ and \$\(\chi\_a\) all in the Greek Dispers—with Alter' the small companion of Mins (7), and since two cher stars not shown on the map, one of them about a degree from \$\chi\_a\) at little above the line joining it to \$\(\chi\_a\) and the other the northernmost of two fifth-engatited stars not quite half way from \$\(\chi\_a\) tower of which later star is shown on the map north of \$\(\chi\_a\). All these eight stars are relatively about as close together as they look to us, and ure at about the same distance from our sides return—the \$\(\chi\_a\) this high-years where the properties of the properties, the motions of all these stars appear to direct with the output of the Minster, and in the directed to on the bordson of the Minster, and in be directed is on the borders of Ursa Major, and is pointed out by a line from # through x Ursa Majoria,

carried as far again. The other stars of the group are also directed away from this point, though they are also directed away from the point, tought hasy are widely scattered over the sky Two of them are nearly in line with the stars of the Dipper, though far removed on each side—\$\beta\$ Aurigas and a Corona. The former is the remotest of the group, about 160 light years away, while the latter is about as far off as those previously described

as those previously described
Farther southward, In quite a different direction,
is the star 3 Leonia, whose calculated distance of 389
lighty-years puts it much nearer than these of the same start would be destribed Finally, and most remarkable of all the splendid filtrus is undoubtedly a member of the same group It owes the brightness to its relative nearons to us—only 3½ lighty-years according to the demands of theory which in this case is offered from the demands of theory which in this case is offered from the demands of theory which in this case is offered from the demands of theory which in this case is offered from the demands of theory which in this case is offered from the demands of theory which in this case is offered from the demands of the order of of the or

we may fix our eyes first on the Negt tle Bear, to which this belongs, whill most conspicuous groups, is easily by most conspicuous groups, is easily hy-a tolerably good "Dipper," though less phrase may be pardoned) than its in The figure of the Bear, as shown in e hardly be made out except that the list ing in Polaris makes quite an unas Polaris itself, apart from its positis as a double star, observable with while the spectroscope shows that the two is attended by two invisib with a period of loss than three da

Around the Bear coils the Brand almost overhead, the Great Boar South of this we find the Lion, the southern sky, the ungainly lengt pent, Hydra. Above this come the sp of the Grow and the Cup, and

east

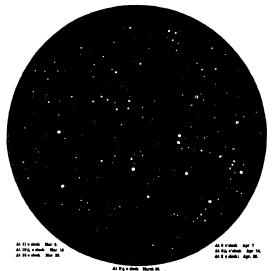
will not be she hour and a half after sun and should be seen shortly after seen shortly after At this time he Taurus, and on the he passes close Pleiades, which he

anrouses in brights Venus is a morning the, rising about 4 A M. on the 1st and 3 15 A. M. on the 30th She is extrain-

the 30th She is extrained by brilliant, and cannot possibly be mistaken Mars is evening star in Gemini, alowly moving castward among the share and still losing in brightness as he recoder from ness as he recedes from us. He is very far aged all through the mouth, we

all through the month and consequently generates for consequently generates for consequently generates for the proposition, and dominates the creating sky Tolescopically, the transite imperitures of his satellites are among the most hardford spectacles in the harvens, especially when the round black and the standards of the satellities can be seen on the planet's shadows of the satellities can be seen on the planet's standards of the satellities can be seen on the planet's standards of the satellities can be seen on the planet's standards of the satellities can be seen on the planet's standards of the satellities can be seen on the planet's standards of the satellities can be seen on the planet's satellities and the satellities can be seen on the planet's satellities and the satellities can be seen on the planet's satellities and the satellities can be seen on the planet's satellities and the satellities can be seen on the planet's satellities and the satellities are satellities and the satellities are satellities.

Bith during the evening hours in our part, git since when the property of the



NIGHT SKY: MARCH AND APRIL

When the actual brightness of the other stars of the system is computed it is seen that Sirius is actually one of the fainter members of the system Its total light is about thirty times that of the sum which that of the Phincipal stars of the Dipper and of  $\alpha$  Coronae averages fully twice as much, and that of a Aorigas is about ton times as pright, and the star of the star o bright.

This system therefore consists of unusually bright are It is remarkable also for the great extent in stars It is remarkable also for the great extent in space Between the cuter fars of the man particular must be hundreds of stars, of which one particular which have no connection with it. It is at it as man which have no connection with it. It is at it are made which have no connection with it. It is as it as most man you will be a supported event and the man speed. Though many of the crowd intervane, the mare fact of thelm progress toward the same point agrees to destinguish them, and is a mark of their common original It may be added in conclusion that a very large proportion of these stars, at least six out of the tem aboun on the map, are either visually or species equically double. Turning now to the constallations, dam

### NOVEL CHANGEABLE PHOTOGRAPHS

BY F. HONORE

Frof. Lippmann recently described before the agademy of Sciences at Paris some novel changeable photographs made according to a method devised by M. Estanave, accretary of the Faculty of Sciences of

Soping woman. By inclining the picture a few milli sters and rocking it slightly, the eyes apparently that like the eyes of a porcelain doll, with the ex-The the eyes of a percentan doil, with the eyes, by were, that the entire face livens up in the extraordinary manner incline the picture of set the eyes alowly close again. The photographs when reproduced for publication in a paper when the set the Scientific American unfortunately cannot be send to obtain the offect because of the new control of the control of the product of th not be used to obtain the effect because of

In order to explain how M Estanave obtains his sisture, let us consider two different photographs. assure, let us consider two different photographs-the one D representing a sleeping woman, the other If the same woman awake Each photographic posi-tive is ruled horisontally from top to bottom, so that both photographs appear finely banded if we refrom the positive D even alternate pairs of bands, and from the positive E odd alternate pairs of bands, and if we place upon the positive D the bands taken from E and upon E the bands taken from D, we will obtain two new pictures which w may designate  $D^1$  and  $E^1$ . These new pictures  $D^1$  and  $E^1$  are composites of D and E. If the bands are narrow enough, 30 per centimeter for example, their

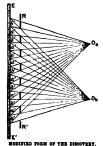


THE SLEEPING WOMAN

discontinuity will not be noticed. The composite pictures will apparently be complete and comparable with the half-tone pictures to be found in the Scien-TIVIC AMERICAN OF IN any other modern illustrated

Let us now combine the two composites  $D^1$  and  $R^1$ In other words, let us transpose strips of  $D^1$  and

strips of E<sup>n</sup> without disturbing their order. We obtain still another positive D<sup>n</sup>, formed by the combination of the two preceding positives. When looked



at directly this new positive  $P^{\varepsilon}$  is rather confusing, but when looked at through a glass plate ruled altornately with horizontal opaque and transparent bands of a width equal to those constituting the positive itself quite a different effect is obtained. If we hold this glass screen in such a manner that the opaque bands cover the bands of the positive E' we will see only the bands of the positive D, and we will obtain the portrait of a sleeping woman. On the other hand, if the screen be slightly shifted so that the bands of if the screen be siightly shifted so that the bands of the positive E' are covered we will have a portrait of a woman wide awake Since the different effects are obtained simply by shifting the screen, the single photographic view seen through it can be caused to hange its appearance very rapidly simply by chang

ing the speed of the screen moves in actual practice the ruling of the positives and in actual practice the ruling of the positives and the transposition of the bands, as well as the use of a suitable screen, is attended with consider able difficulty For that reason, M Estanave has devised a simpler method which is illustrated in the accompanying diagram

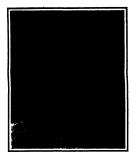
companying diagram
Let a and b be two different objects the luminous
sys from which fail upon a sensitive plate or a
round glass HS In the path of these rays at a ground glass BE In the path of these rays at a suitable distance, the horizontal ruled acreen RR is placed in the diagram the spaces separating the lines of the screen are considerably exaggerated and the screen itself is shown in vertical section. Such is the position of the screen that the sensitive plate will receive a series of images of a alternating with

In making the positive photograph according to this method, the subject is first placed at Og and then at Ob At Og the subject must appear asleep, and at Ob wide awake A composite picture will be obtain on the sensitive plate If this picture be examin

through a screen similar to that by means of which the picture was made, and the visual angle be varied either by shifting the eye or shifting the serven the portrait will apparently open and close its eyes

Theoretically several different pictures can thus be Theoretically several different pictures can thus be superimposed. In actual practice M Estanave has combined three which are clearly visible However there is a limit to the number of pictures that can thus be combined for the positives become more and thus be combined for the positives become more and more incomplete as the filtrem bands composing them are more and more elongated in the case of two aspects, the elements of an image are adjacent, the one to the other with three aspects, the consecutive elements of an image are separated by two elements belonging respectively to each of the two other images and so on

In order to simplify the adjustment of the screen relatively to the composite image, and in fact to avoid adjustment entirely M Estanave employs an improved autosetroecopicy late which he has in vented. This plate is ruled with a serven on the side which is not emulsfield, the rulings being such that alternate opaque and transparent bands are produced The new invention of M Estanave's is so con-ocived that the plate serves a double purpose. The plate is mounted with the ruled surface in front, or plate is mounted with the ruled surface in front, or it can be so plated that the ruled surface is either horisontal or vertical. When the ruled surface is placed horizontally changeable photographs are ob-tained. With the ruling vertically placed images can



TRE WARING WOMAN

be obtained directly visible to the eye with a store scopic effect. With two stereoscopic lenses mounted so as to obtain fillform images formed by the super position of the two images of the object taken under the same aspect, the vertical lines of the screen select for each eye the particular image of the stereo-scopic couple which are intended for it

### Mother-of-Pearl Imitations,

At a very early period repeated efforts were made to replace mother-of-pearl, so expensive at times, by some substance possessing the same valuable proper-ties, but the results arrived at always fell far short of the expectations which were entertained, and these of the expectations which were entertained, and these attempts were, therefore, gradually entirely aban-doned Recently attention has again been directed to the same problem, it being believed that the progress made in chemistry and applied science afforded grounds for hoping for more favorable results. And, in fact, some of the imitations of mother-of-pearl now in fact, some of the imitations of mother-of-pear how made seem to show that these expectations will not be disappointed. It is true that hitherto but few detailed directions for making artificial mother-of-pear have appeared in technical literature, for the simple reason that the methods which have led to successful results have for the most part been kept carefully secret, but a careful study of international carefully secret, but a caseful study of international patent literature shows that there are now various processor for making these institutions, sees of them resting on a solid scientific basina. It is at once wri-dent that imitations such as sheet guidates except in flabbacks conserv. or Cologon gives asturated with abstraction silver will never gain a footing as goodine substitutes when, for instance, not even the well-staging, equilated mother-of-pears can gain recognition,

as an equivalent. The purpose to which artificial as an equivalent. The purpose to which artificial mother-of-pearl is applied determines the degree of its efficiency as a substitute, and this degree of efficiency in its turn depends mainly on its external resem-blance to the natural product. For combs, has join heads, etc. celluloid mother-of-pearl may be used without hesitation as an imitation, for ornaments, on the other hand, such as fastening pins, buckles, etc. the preference will naturally be given to substances whose external resemblance to the genuine material is complete or nearly so Special interest, therefore, atexternal recombinate to the guntile material is com-plete or nearly so Special interest, therefore, at-taches to a new method of preparing artificial mother-of-pearl, which we proceed to describe in detail The ascertained fact that collodion, mixed with car-

bon bisulphide and a few parts of pearl-silver fluid, yielded a substance more or less resembling motherof-pearl, led to a method of working directly with of-pear), led to a method of working circetty with cellulose solutions, and in this way the celluloid mother-of pear! airway mentioned was obtained a material which has been used for a variety of pur-poses in the industrial arts. As, however, the in-formability of celluloid considerably restricted the employment of this new material, efforts were made employment of this new material, emorts were made to replace collubid by another substance. This sub-stance was callife. The process of preparing artificial mether-ed-pearl from this base is as follows 100 parts at callific dissolved in 80 to 100 parts of glacial social

acid or chloroform are mixed with 20 parts of call cined magnesia and 4 to 8 parts of pearl essence, with cined magnetia and 4 to 8 parts of pearl reserve, with continual stirring. In this way a more or less visal mass is obtained which is allowed to dry in the air if a few drops of carbon blainhide are added to the liquid solution a beautiful iridewest inster is imparted. As cellit dissolves comparatively slowly, it is advisable to prepare the solution aday or two beforehand Is case of need, the process of dissolving may be somewhat accelerated by slow heating in a water-bath. When dry the artificial mother-of pearl presents the appearance of polished mother-of pearl plates but in addition it is distinguished by great ductility and elasticity. The treatment of this artificial product is, therefore much easier than that of genuine mother-of-pear! It has also been attempted to substitute mother-of pearl dust for magnesia and very satisfactory results have been obtained in this way it is also possible by means of this process to produce artificial pearls exactly like real ones for this purpose the artificial product is propared in rather thick plates from which allow are cut and pearls of any desired size and form turned on the Those pearls are superior in point semblance to the natural product to the fish or wax pearia hitherto made from glass and are not so brittle as the latter — Deutsche Goldschmiede Zeitung

### NOTES ON OVERHAULING A BO BY ALBERT F. BISHOP

Square Bunging for Boats.-- I think square bungs are a big improvement over round bungs. They do not weaken the planking or chafing streaks and may more quickly be inserted

The chaffing strick on a round stern that has been bunked with round bunging invariably breaks sooner to later a her the round bungs have been insorted Whyre the square bung is used the nail is driven and



SQUARE BUNGING

set. The square punch which is a trifle larger than set The square punh which is a trifle larger than the nail head, by them driven in making the aperture for the square bung. This punch should be hardened and ground in an oneary whee I making the corner just us keen and sharp as possible. Obtong rectanguists bungs are professible where the boat mail is used in planking etc. The bungs are quite easily made \$\frac{1}{16}\$ of an inch sequero with a small bung aw, Utiling the saw table slightly to produce the taper on two

sides of the bung

Wheel Calker—The wheel calker illustrated herewith will easily force cotton into solid wood where with will easily force cotton into soils wood waters there is no some or joint. The shape gives one con siderable leverage. The cotton is first placed along the seam by attaching it with the point of a knife at short distances, just enough to keep it in line with



It is now ready for the knife shap which calks it very rapidly Take a strip of iron % by % inch thick, 2½ feet long and bend it to a flaring Ushape The bottom of the U should be 4 inches across and to it the wheels are riveted The iron strip should be drawn down a little on the ends to receive smould be drawn down a little on the ends to receive the handles. The wheels are 1% inches in diameter One of the wheels has a square edge 1/18 of an inch thick. The other wheel is 3/16 of an inch thick with the edge sharpened like a knife. There is a simple gauge placed on the framework near the square edged wheel which allows one to force the cotton to the desired depth to receive the putty

Marking the Water Line on a Boat -Level the boat Marking the Water Line on a Boat—Lavel the beat athwartships and decide where you would like your water line, which in the case of a launch or small motor beat should be from two to three in these out of water when the boat is affect. Take two straights to depen 2 or 1 feet long placed level athwartships to the boet one at the bow and one at the stern at the beight of the water line decided upon Struck a



MARKING THE WATER LINE OF A BOAT.

cord across the straight edges with the weight at each eng to keep it taut and let it just touch the blige of the heal The proper way to make a true line swith the bull a thin batting 7 or four inches wide and 10 or 12 feet long with the upper edge pressed against the boat to correspond with the dots. Re particular to keep the batting exactly plumb edgeways and you can correctly

scratch in your water line.

Simple Method of Weighing a Boat.—Take a lever six or eight feet long, place a fulcrum on the ground

now the bow Let the fulcrum (at 2 in the drawing) be just six inches from the end (1) of the lever that is under the bow of boat. A person that would well, say a hundred and fifty pounds, should work along on the lever, may to 3 or until the weight of his body would just lift the bow of the boat clear of the block With a piece of chalk make a mark on the lever is point. Divide the distance from the fulcrum at this point. to the chalk mark into 8-inch spaces and add 150 pounds for each space. For instance, eight space



WRIGHTER A BOAT WITH A LEVER

would mean 1,200 pounds, which would be a little le would mean 1,200 points, when would not a little less than half the weight of the boat, as the bow end is generally the lighter Now raise the stora with the lever in the same manner. The boat boing heavier at this end will call for more spaces. When this weight has been determined add the two weights and the re-sult will not be far out for the entire boat. The blockings the boat rests on while the boat is lifted should be at the extreme end.

A Home-made Lifting Jack.—The jack here illus-

A Home-made Litting Jack.—The jack here illus-trated is made with a screw an inch in diameter and eight or more in length and a good heavy but, the corners of which have been notched down with a file to receive a heavy washer The part of the nut which comes through the washer should come through far



A HOME-MADE LIPTING JACK.

nough to allow for good heavy riveling on the wa enough to allow for good heavy riveting on the washer This makes the base for tife nut to rest on and it is then placed on a worden block, which is well secured with four wood serves. The base of the jack is a heavy block placed with the grain running at right angles to the upper block which holds the nut. The cap and lever require no description. The broad beas revents the black from settling in the earth and from capaixing as well, which is a good feature ground boat

A Home-made Wheel Puller -- A simple wheel puller can be made by taking a piece of maple about  $3\frac{1}{2}$  inches square and about sixteen in length and fitting it with the bolts about as shown in the accompanying The nut for the center screw has the



HOME-MADE WHERE PULLED.

attached to it in the same way as in the lifting jack and it is similarly attached to the maple. The wheal to bolic carry two bread suits to catch on the rear face of the web or apotes of the wheel. The wheel is shown in dotted lines. This service is often recorded to in removing wheels (rong gaselline engines. This is—insert and the lifting look have been in use four or five years. They have slood bots of wear spit apprently are an extrangle very large lifting look have been in use four or five years. They show slood bots of wear spit apprentic are an extrangle over. A protect, prepared

on the wheel puller is obtained on the outside helps with any suitable wrench.

Convenient Flywheel for Gasolene Enginee all the flywhees for small marine graciene earths are filled up with spokes or wobs with few holes, in them, which makes it very awkward to get at the secentric strap and pump to tighten the nuts and state box. Nearly every time this is done the man in deal of the engine uses a cold chisel or screwdriver hammer I have designed a wheel and used a engine for four years. It has only two engine for four years. It has only two sub-hand rim, doing away with the cranking which is a dangerous feature. The plate byte floor covers the key as well as the epiches, a tached with two machine screws.

This makes a very tidy looking wheel the looking wheel wh



A CONVENIENT PLYWERE.

caught in the spokes. It is a great convenience in cleaning behind the wheel or repainting, as it does not take a minute to remove the cover plants of the spoke style of wheel is used
Tunnel for Gasolino,—The tunnel here sho

Tunnel for Gasolino.—The tunnel here showings a practical one of you can captate a few gallon end of of gasoline and allow it to rest in the tunnel until \( \tilde{\end{array}}\) is empty, as illustrated in Fig. 1 A brees or vinig will not blow it one side slopping it over, which atways happens when the principle of the can into the analysis of the control of the can into the captain of the can into the captain of the capt



DEPROVED GASSLIER THEFET.

DEFANCED ABBILITY TOWNER.

and should always be smaller than the receiving hele in the gasoline tank. The supports for the tunnel are made out of galvained irea I inch wide and I/II likely. But the content to the angle of the cone while the lower and is bent around a of the cone while the lower and is bent around; as the cone while the lower and is bent around; as the cone while the lower and better than the support part of the tunnel is good proportion. The part of the tunnel is good proportion. The parts that are attached can readily be procursed. The parts that are attached can veil moldered H is not necessary is river them. Place a viru gauge shout fifty or sixty much to the hindle of the tunnel. If a channel sitter is desired make a band of mostal that will seatly site indeed to toper part of the tunnel. He he lower and of this is covered with channels, which is held in place with mail twine. That a sating of valenained fiber to the measuring stick.

The graduations of gallour should be included by the

measuring stick.
The graduations of gallons should, he marked a
lamp black mixed with shellout. The velocities of it
turns a sharp and predictions when these
generation, which as transfer to the state of the state

### RECENTLY PATESTED INVESTIGAT.

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AFFACTORISETY FOR GALBERY-SUPPORT.

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BR.—CLEMENT WHICH IN EXPOSE A LILechmant Which can be used in piece of buttons,
and which will cause the supporters to have
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Mardware and Teels.

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INTERNAL COMBUSTION ENGINE. -1. F SLAMP, Deney, Colo. The object of the pre-ent invention is to provide an internal combus (for engine more especially designed for us in tunneling and other machines, with a vice to cause a cutting tool to deliver or atrib-blows on rocks or other material, without in Jury to the operating parts of the engine

The Merchant of Provincia & Options.

BRIGHER — Pro D. Pottaces Merchant, Utah & Provincia Merchant of Provincia & Comments & Merchant & Comments & Commen

### duining to Vehicles.

Bortaining to Vehicles, SPRINO WHIGH. — A B MIRRIN, Hidden This inventor has for his object be provided or of a wheel whe rise, the short the provided or of a wheel whe rise, the shoot with a fathe wheel, these far registent or pitable so as to not in the capacity of a perine. In this way, the jars and joils are taken up to the spring rise of the which and no other applies are necessary.

springs are necessary.

WILNELD J. Foveres Hot Springs.

Ark This insention is an impresent the wrench is the wrench is possible designed.

For one in wagons for the which out and effect early necess the purpose for which it is de-signed. The cross-both has a squared portion adjacent to its hoad and the ownbur rectified the self-square portion is correspondingly formed to prevent the turning of the best.

formed to prevent the furning of the bolt at FINALISH LEFALLER (A. SERTEL MATTER) (A. SER

emissing the engine. If the variety of the control of the control

gide of the road IRAN DEVICE, FOR INI CYCLOS IN PROCESSOR JOSE, FORCE THE CYCLOS IN Processor, Joseph France The device canable in First for process a genduaried present of the Cricims bette appear into the construction of the West Wine causting and further the device is constructed on that shock when the construction of the Cricims o effective operation

Norm.—Copies of any of these patents will be furnished by Munn & to for the cents each blease state the name of the patents: title of the invention and date of this paper.



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| B.S., E.B. New York McGraw-Hill  | Monell, M D New York William R.<br>Jenkins Company, 1910 8vo., 465<br>pp., 23 plates Prics, \$4 net.   | AILNIO   | C. Perkins Mactric light supporting brushet J P Hebondahl  | 962 911   |
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| TELEPRORGEOUS By H. R. Van Deventer,<br>B.S., E.B. New York McGraw-Hill<br>Book Company, 1910 Pp 586, 682<br>illustrations. Price, \$4   | pp., 23 plates Price, \$4 net.   | TRADE MARKS  | Beergier light segenting branks J. F. Schrift months be dest states outstalling segenting segment of the segmen |   |
|  | The author describes in detail how he has<br>used high frequency currents in medical treat   | TRADE MARKS DESIGNS OOPTROUTS &C.  | Micrical ping receptacie G B Thomas  | 802,901<br>802,901  |
| paring a very complete description of modern<br>salephone appliances. It takes up the subjects   | ment and dentistry, explaining in detail how he<br>applies the treatment for specific ailments.  | INVESTORS are torited to communicate with  | Elevator door looks means for operating J<br>E. Boyce  | 052,604   |
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| repairs they are liable to need, and how to  | Inc. By Henry C Horstmann and<br>Victor H. Tousley Chicago Freder-<br>ick J Drake & Co., 1909 16mo., 281<br>pp., 128 illustrations. Price \$1.50   | to securing valid patent protection for their in-<br>ventions. Trade-Marks and Copyrights  | Fingine cylinders water jacket for, E. B.  | 952,176   |
| remedy the troubles that so frequently beset<br>telephone systems. The book flow not describe  | Victor H. Tousley Chicago Freder-<br>ick J Druke & Co. 1909 16mo . 231   | registered. Design Patents and Pereign Patents areared. A Pree Opinion as to the probable patents.   | Hugher starting device caphochen (i M  | 902,TNS   |
| all types of telephones nor go exhaustively into   | pp , 128 illustrations. Price \$1.50<br>This book is intended for the practical elec   | A Prec Optimen as to the probable patenta-<br>bility of an investion will be readily stren to any<br>investor furnishing us with a model or statch and<br>a brief description of the device in quantion. All   | erty   | 802.834<br>862.878<br>802.834   |
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|  | about the theory of armature winding to enable   | communications are strictly confidential. Our<br>Hand-Beek on Parents will be sent free on   | Rainvator W   Bester   | 962,463<br>962 478  |
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| board and other troubles. The book is one<br>which no practical telephone man can afford to  | THE CALCUUM AND ITS APPLICATION BY<br>Robert Gordon Blaine, M.E. New   | Can banks T. II. Massan 952 014  | Fred water purifice F R. Reyon<br>Freder, positry F Roon, Jr   | 062 638<br>802,710  |
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| LEPRONT By William Mayer, Jr<br>Mayer Publishing Company, 1910<br>8yo , 366 pp , 258 illustrations Price,  | The use of the calculus has come to be of such importance in engineering work and par-   | Car door op rating mechanism street Volk   | Filter G L Allen Fire extinguisher Fulrweather & Their   | 002 973<br>962,618  |
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### The Design and Construction of Induction Coils By A. FREDERICK COLLEGE

William Aller directions for maintage details full per-directions for making eight different de colls, wrying from a causil one giving a mil-inch oppris in a large one giving to the sparks. The dimensions of eight and every was to the smallest group are given, and the rightess are written in language outly con-tryling and written in language outly con-

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Polonium was the first of th substances separated from pit residues by Mms. Carle. Vario ods of come lonium mixed with blemuth obtained many thousand time ive than uranium. March Ive than transum. Marawama isoparated from 15 tons of pitchble about 3 milligrammes of intensely ive material which he called radii lurium, since it was separated nit with tellurium as an impurity. By with tellurium as an inspurity. By dip-plut a copper plate into a solition of this sinkstance, he obtained a deposit sig-weight not more than 1/100 milligramme, which was far more active than an equal weight of radium. It was soon recop-nised that this preparation was identi-cal with polonium, for it gaze off the typical a radiation, and had the charac-teristic rate of decay of that substance. Unfortunately, Marckwald was not aware at the time of securation of the areast Unfortunately, Marckwald was not swars at the time of separation of the great importance of testing whether jeed appared as a product of transformation of expensed as a product of transformation of the major of the product of the second of the sumerous of the sumerous of the second of the sumerous of the second of the sumerous of the second of the se

radium series. It is hald/mansformed in about 140 days, emitting a particles dur-ing the process. Rutherford showed in 1904 the polonium was in reality a trans-formation product of radium itself. Ra-dium at first change in the emanation, and then successively into radium A. B., C. D. E. F. radium F being identical in all respects with the polonium directly apparent of rom a radio-active mineral. When the radium commands in allowing the con-traction of the radium of the radium of the radium of the to decay in a sender giass then, the walls When the radium emanation is allowed to decay in a socied giass tube, the walls of the tube are coated with an iavisible deposit of pure radium D, radium E, radium F, but the amount of the last to be obtained in this way is far too small to be weighable.

small to be weighable.

The amount of polonium present in any radio-active mineral can easily be calculated. Since the radium and polonium (radium F) in a mineral are in radioactive equilibrium, the same num-ber of a particles are expelled from each per second. Since polonium is half transformed in 140 days and radium in 2,000 years, the former breaks up 5,000 2,000 years, the former breaks up 5,000 times faster than the latter The maximum amount of polonism to be obtained from a minearl is in consequence only 1,5,000 of the amount of radium. In 1,000 kilogrammes of pitchbleade containing 50 per cent of uranium, there are present 170 milligrammes of radium. The weight of polonium is about 1,5,000 of this, or about 1,500 milligrammes, it is thus obvious that to obtain 1,500 of amilligramme of the present polonium, several tons thus obvious that to obtain 1/10 of a ml-ligramme of pure polonium, several tons of high-grade pitchblends must be worked up. The most natural source of polo-nium is radium D (radio-lead), which grown polonium and has a period of half transformation of about twenty years. Shope colonium breaks up about 5000. Since polonium breaks up about 5,000 times faster than radium, its activity, weight for weight, should be about 5,000

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weight for weight, should be about 5,000 times greater than that of redium. There is nothing surprising in this, for the radium emanation has an activity about 200,000 times that of redium, while radium A (period three minutes) must

Since polentum emits e particles, of its products of decomposition, as bit the other e-ray products, abould helium. The production of helium as a preparation of polontum has been served by Rutherford and Boltwood wred by Rutherford and Boltwood inchester Lit. and Phil. Society, No-ber 30th, 1909), and also by Mme. is and Debisrae in their present ex-ments. Boltwood several years ago pasted that the end product of the tim series was lead, and has collected reaum series was sead, and has collected strong evidence in support of this view by comparing the amount of helium and lead in old radio-active minerals. Since polenium is the last of the active prodpotentium is the last of the active pro-nots observed in the radium series, it is to be expected that polonium should be transformed into belium and lead, one atom of polonium producing one atom of helium and one atom of lead. This of helium and one atom or load. This point of view receives additional weight from consideration of the atomic weight to be expected for the end product of radium. Since in the uranium radium series, seven a particles, each of which is an atom of helium of atomic weight four, are successively expelled before radium are successively expelled perfore radium P is reached, the atomic weight of polonium should be  $7 \times 4 = 28$  units less than uranium (atomic weight 238.5). This gives an atomic weight of polonium of 110 5, and after the loss of an e particle, a final product of atomic weight 208 is -a value very close to the atomic weight

It is a matter of very great interest and importance to settle definitely whether polonium changes into lead. The whether polonium changes into lead. The evidence as a whole has long been in favor of that supposition. The outlook is very promising that the experiments of Mms. Curis and Debierne will settle or Mms. Curre and Designe will settle question conclusively. No doubt an interval must elapse to allow the polonium to decay before the final examination of the residual substance can be made.—Nature.

The Revolving Safe.

The revolving safe is the latest advance The revolving safe is the latest advance of the safe industry in its continuous contest with the burglar, who, in the most recent times, has taken to working with the cutting burner, which, by means with the cutting burner, which, by means of an exphydrogan or expresslytene fame, can cut through the heaviest armored sate in a few minutes. The revolving sate makes the employment of the cut-ting burner absolutely impossible. It consists, as Technische Rondachau de-scribes it, of a steel strong hox, closed on all sides, of polygonal section, arranged to revolve on ball bearings, and inclosed in a spherical compartment, built of strong massury and closed above and strong masonry and closed above and below with masonry, in such a manner below with macoury, in such a manner that the steel strong hox can revolve on its wortical axis, without coming in contact with the walls. In the inclusing macoury and in the strong box, doors are contrived, by means of which the strong box is accessible from outside, as long as it is not revolving, which would be the case for hartance during the business of the contact of the c is switched on and the strong box then
revolves at a uniform rate of speed uninterruptedly until a predetermined
period, to which a clookwork comected
with the switching apparatus is set, when
the moving mechanism is automatically
invitable off. While in revolution, the strong box is

With its revolution, the strong box is shearbirdy unamnitable. The silectric motor and the storage battery are placed inside of the steal chamber, cannot therefore be tampered with from cettalie; any interruption of the revolution, so matter how embead, and any decrease in the placed of the revolutions, is amounted at man, with the sid of alarm devices, and the material strength of the material strength of the substitutes should have accounted in the material strength of the substitute through the findings generately they cannot extract the consistent painting strength of the substitute of the subst



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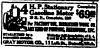
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ed from page 289.) the fiame cannot be brought to inst any one point in the armor enough to melt it through.

The Action of Radium Respection Upon the Elements of the Carbon Group.

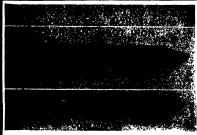
A lively sensation was created two ago, by the publication of Sir Wilyears ago, by the publication of the action of radium emanation upon copper Ac-cording to Ramsay, the energy released emanation rauses a disintegration of the atom of copper, and converts that metal into elements of smaller atomic weight, which are included in the copper in Mendelseff's classification Ramay claimed to have found, among the products of the action of the emanation upon copper, minute quantities of potamium, sodium and lithium Madame Curle repeated Ramany's experiments, but failed to obtain the same results, and pointed out certain possible causes of error in the method employed by the English physicist. Ramany has since repeated the experiments, taking care to peated the experiments, taking care to climinate these possible sources of error, and has reached the same results and conclusions as before. He has lately ex-tended bis researches to certain elements of the carbon group (sillion, titanium sirconium, thallium and lead), which, if his hypothesis is correct, should be dis-aggregated by the action of the same tion into simpler elements of the same group, and especially into carbon

The following method was employed by Ramsay and his collaborator Usher From a solution of radium bromide con taining 211 milligrams (about 3 grains) of the metal radium the emanation pro-duced in the course of one week, together with the explosive mixture of hydrogen with the explosive mixture of hydrogen and cargen which always accompanies it, was extracted by a pump The total quantity of gas thus obtained amounted to about 25 cubic centimeters, and con tained 0.0912 cubic centimeter of radium emanation, mixed with nytrogen, oxygens carbon dioxide and other gases. The hydrogen and oxygen were combined by explosion, reducing the volume of the gaseous nixture to ½ cubic centimeter. This was collected in a small glass tub-conted with fused caustic potash, which of an hour The residual gas was then introduced into a glass flask containing the solution which was to be subjected to the action of the emanation The con tents of the flask were left undisturbed for four weeks at the end of which period the activity of radium emanatio is completely exhausted. The gas was then drawn off and analysed

It was found to contain carbon dioxide invariably and carbon monoxide in some invarianty and carbon monotone in some cases. The following table shows the quantities of carbon thus produced from various solutions by one cubic millimeter of radium emanation

Hydrogen silicon fluoride H,SiF. 0518 Titanium sulphate Ti(SO<sub>i</sub>), 0982 Zr(NO) 9 873 Th (NO<sub>s</sub>), Thallaium nitrate Ph(ClO.). Lead objects

Rammay and Usher conclude that caris produced, in greater or smaller atity, from all the other elements of rarbon group by the action of radium nation. The elements of high atomic weight, with the exception of lead, which ems to be particularly stable, appear to disaggragated more easily than the ements of low atomic weight. Experiments on elements of other groups are in progress, but those described above ap-pear to prove beyond question that the atoms of the chemist can be broken up by the action of radium of Retue des Sciencisi



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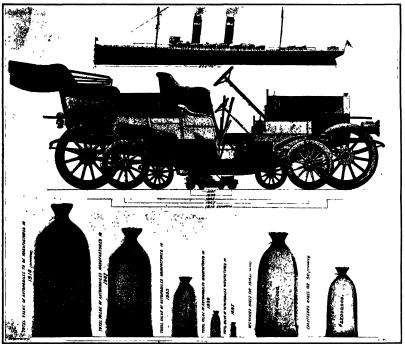


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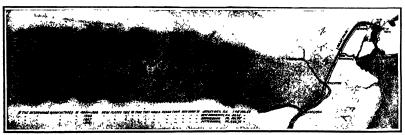


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NEW YORK, SATURDAY APRIL 9th, 1910

The Billier is always and to receive for a commution illustrated articles on subsets of timer interest. If the photographs are sharp the articles short and the fine cardinate, the contributions will receive special alternative. Accepted articles will be paid for at regular space rates.

### LIEUT SHACKLETON

TOWEVER thrilling the average man may find Lieut Shackleton's modest and self-effacing recital of the Antaretic hardships and tri umphs of his brilliant expedition it is to th scientist that the English explorers character must assuredly appeal most strongly. No doubt the dare devil courage of the Englishman, whose love of adven ture has carried him into the heart of Africa, the wilds of Australia, and the mysteries of Thibet enters largely into Sharkhton a nature. How else could be have endured the numbing cold and the panges of privation? But the sacrifices made during that famous expedition which brought him within actual sight of the South Pole are exacutially scientific in character comparable with the herolam of the man who exposes bimself to the stings of disease-carrying insects, that mankind may know how best to protect itself as e ravages of yellow fever and the sheeping sickness His modesty of demeanor and speech his generous praise of those who accompanied him, his liberality in donating mineralogical and ornithological collections our museums (collections made when the desire was strong to abandon them in the hour of weakness and hunger) and above all that unwillinguess of his to appear as rival to Capt Scott his former chief, which has led him to postpone his own Antarctic plans so that Scott may have no difficulty in obtaining funds, are all characteristic of the unsolfish scientist in whom the sense of personal importance is overwhelmed by the high ideals of the cause in whose furtherance he is

Scientific too in its purpose is the expedition that Shackleton has postponed in deference to Scott, for that expedition will be undertaken not primarily to reach the Pole but to fathom the many mysteries of the unknown land fronting on the South Indian Ocean and presenting many scientific and geographic prob-lems for solution. By systematically exploring the coast around King William Land a coast which has never been carefully studied from shipboard because of float ing ice he will probably determine once and for all made by Admiral Wilkes to the first discovery of the Antarctic Continent Shackletons so use of fair play, his sense of scientific justice in other words, cul-nently fits him for this peculiarly delicat task. The hearty recognition whith Shackleton has ac-

The hearty recognition which Shackiton has accorded Party for the discovery of the vorth Pole coming as it does from a man who knoss something of the rigors of polar exploration outset to shame the Congress which is riused national honor to Peary without proof of the North Poles discovery. The doubt which has been footinhly said on Partys exploit by a congression whose "furthest north" as may Washington correspondent phrased it is the sent irreplat cold of coming when the constraints of the control of the contr

A FLEA FOR CO-OPERATION. city has reached a critical stage, for upon the element of the next few months will depend the question whether a certain proportion of future subway travel is to be paid for at the present rate of five cents per trip or at double that amount Non, it is generally agreed that one of the indis-pensable conditions of the future development of the pensible conditions of the future development of the subway system in this city is that the fare shall at no time exceed five cents, for which sum a passenger must be at liberty to travel from any one part of the system to any other. The universal todency today is toward the cheapening of transportation, and the possibility of an increase from five cents to ten cents per trip is not to be considered for a moment.

vertheless, the people of this city are to-day con ed with the possibility, if not the probability, o just such an increase of fare, and this condition is due in large measure to the strained relations between the Public Service Commission, whose duty it is to and the transportation interests of the public, and the Interborough (ompany which has a practical and the interference of company which has a practical monopoly of local transportation. The Public Service Commission will shortly call for bids for the construc-tion of an additional subway extending from the Bronx to the Battery, which will be absolutely independent of the route which is now in operation. The new line as laid out would be an excellent one, were it not for the laid out would be an excellent one, were it not for the grave defect that nowhere does it make connection with the existing subway. This defect however, must be made good by providing for such connections as will enable a passenger to travel for one fare from any point on the one to any point on the other system any point on the one to any point on the other system if we look at a map of the present subway route, it is evident at a glance that an extension of the existing lines north from Forly second Street through Lexing-ton Atenue to the Hronx and an extension of the Broads av line from Times Sausre down Seventh Avenue to the Battery, would provide the city with independent north and south routes The Public Service Commission long ago recognized that this was the next logical addition to make to the present facilities and they hoped that the Interborough Company would make a proposal for future extensions of their system over these routes Unfortunately, the company, in offering to build these lines, has obstinately saddled its proposal with a demand that it be allowed to build a third track on one of the elevated railways of

the Kost Side Now the city, as the Interborough Company very well knows has established for all time the principle that, since the existing elevated structures are a that, since the extensing elevated structures are a cell are ment of the streets in which they stand not only shall no further extensions be made but as soon as other facilities are provided, the cristing structures shall be removed Therefore, the Public Service Commission at once and very properly refused to ascede to the Interborough proposal, and, ostensibly, it is upon this question of extending the elevated service is upon this question of extending the elevated service intent the Commission and the company are all variance. Failing to get any satisfactory proposal from the Interborough Company, the Commission have laid out an independent route which extends from Woodlawn and Pelham Bay Park in the Bronx to the Harlem. River, and down Lexington Avenue and Broadway to the Battery Bids will shortly be asked and as we have noted above unless the Interborough should put in a bid agreeable to the conditions laid down by the Commission, the new line will be built independently of the existing subway Thereafter, if anyone should have occasion to make a trip involving a transfer from one system to the other he will be able to do so only by the payment of an additional fare—a condition which for a large proportion of the traveling public would amount to a positive hardship

Now the contingency of having to pay a double fare is so serious that it demands immediate and careful consideration. We believe that the exercise of a more policy by the interborough Company as recrai pourcy by the interporough company and the exhibition by the Public Service Commission of a lit-tle more confidence in the attitude and purposes of the Interborough people would result in a compromise of lasting benefit both to the corporation and the travel ing public. The Interborough Company certainly owes much to the city, and we say this with full remem brance of the fact that Mr Belmont, at a time when capital was looking askance upon the subway proposi-tion, came forward courageously and provided the enormous capital necessary for construction. He has received in the past and always will receive credit for the good service which he rendered to the city in for the good service which he rendered to the city in a very critical emergency. But having admitted this much, we cannot lose sight of the fact that events have proved first, that the subway property is senor-mously profitable and second that the terms governing the relationship between the operating comp and the city are very liberal indeed. If Mr Belm conferred a great benefit upon the city, the city has repaid him tenfold by providing the subway line with traffic far greater than was anticipated when the road was built

the Interborough, with its magnificently equipped system, its thoroughly trained personnel, its strong financial standing and its rich accumulation of operating experience, is obviously the interest best equipped to build and operate the new line, making it equipped to outle and operate the water, making it an integral part of its present system Provided it will give reasonable guarantees, the city would just as soon, and perhaps rather have the Interborough as soon, and perhaps rather have the Interborough people build and operate the new system than any other outside interest Unfortunately, the attitude of the company toward the rity in the past, as shown in its almost contemptuous treatment of the Public Ser-Commission, has had the inevitable effect of prothe company on the part of the public. This tunate, unnecessary, and, to those of us what stand what a really magnificent service, judgment. sast from the technical side, the company is ing, it is to a certain extent unjust.

Aren pil

The present juncture affords a great opportunity to the Interborough Company If it will only waite to never-to-be-granted demand for further elevated resinever-to-bergranted domand for further selvants "above facilities, the city will meet the company for a liberal spirit. Should the company put in a Md for he new line with a pledge to operate it as part of their existing system upon a single-fare basis, they will solve at once the problem of the present coagustion on their own lines, they will more standard to the extent of their already encouragely prefinable 5602 of operations, and they will place themselves mose proposed of the great city-accordance of the company of their spirit company, which will not be the least weighty of these above enumerated

### A REPORM IN METEOROLOGICAL SWITE,

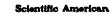
N common with the other sciences, metaorology is burdened with a dual system of units. Great Britain and America continue, in a majority of their meteorological publications, to record rain-fall and atmospheric pressure in inches, wind velocity in miles per hour, and temperature in Fahrenheit dewas, while all the other nations have long a grees, while all the other nations have long sizes and option displayed and option displayed and option displayed and option the property of the size of the same respective measurements. There have of course been many projects of reform, but only very lately has uniformity actually been atland in any branch of the science of the limited States Weather Bureau of the British McIerrologist of Office have definitely adopted the metric of the science of the size of the size

system and the degrees of the Cer tigrade temp scale for recording the results of the observations made with kites and balloons—the former at its research observatory at Mount Weather, Va., and the latter at veral "aerological" stations now in opera British lales

The British have gone a step further The tempera-tures met with in the upper air are very frequently below the freezing point, so that the tabulated observa-tions expressed in the Centigrade scale, abound in negative values, which are awkward to deal with and also a fruitful source of errors in computation absolute scale, counting in Centigrade degrees from the absolute zero (-273 deg the absolute zero (—Zii deg C) has an engative values, and the use of this scale is now common in the discussion of many physical problems with which up-perally research is tiosaly concrended. For these rea-sons the Meteorological Office has begun using the absolute scale islase called the Kelvin scale) instead of the ordinary Centigrade scale in all records of tea-prature obtained by means of thick and ballooms. A no less radical reform has been introduced in the pub-lication of barometric pressure, in the same class of British observations The unit adopted is a C G S. unit of force, viz., the megadyne per square centimeter, in place of the familiar units—inches or millimeters in place of the laminar units—incase or millimeters— expressing the height of the mercurial column. As a matter of fact, the "mercurial column" is a pure fic-tion, so far as the observations in the upper air are concerned, the barometers attached to the kites and balloons always being aneroids, and it is much less important to know the height of this imaginary colimportant to know the height of this imaginary cod-um at any level than to know the fraction of the at-mosphere that lies above or below the level. This frac-tion is directly indicated when the C o B unit is employed, since I megadyne per square continuets in practically coultwise to a baroneer reading of 750 millimeters. In latitude 45 deg., which is the average presence of the stat at 105 meters above sea level in the same latitude. Hence, if we assume 104 meters above sea level as the plane of reference in barometry (and there are sound reasons for preferring it to sea level, the plane heretofore in use), the C G S unit may be considered a "C G S atmosphere," and the may be considered a "C G S atmosphere," and the fraction of a megafyne per square resultineir recorded at any initiation gives, for all practical purposes, the fraction of the atmosphere that lice above the point of observation. This unit has been named the bor, and its use in all meteorological observations has been recommended by several writers during the past year. Lastly, the Meteorological Gloss is now, in its kits and balloon work recording the direction of the wind in decrees of a circle, countiles from true morth. Seat-

in degrees of a circle, counting from true north. East is 90 deg , south 180 deg west 270 deg , and north 860 deg

It is proposed to establish a wireless telegraph sta-tion at the metaorological observatory on Mount Miration at the meteorological observatory on Mount Mir-dor in the Philippines, to give warning of typhome to vessels in the China Sea and points along the China coast. A similar ration will probably be eshablished later at Santo Dominge de Basco on the Jaland of Batan, for communicating information of the pre-sace of typhonous in that vicinity to the besiquaries of the Philippine Workler Bureau et Manglia.



### A 1916

ENGINEERING.

The same found of conail enceration at Panama during survey was \$463,855 onbie yards, of which professionally survey was \$463,855 onbie yards, of which professionally steam sherels. The amount taken out by the Panama during their occupancy of the canal was about \$4,865,850 onbie yards. Under American occupation, \$74,865,850 onbie yards. Under American occupation, \$66,850 onbie yards have been removed, leaving \$74,977,950 onbie yards have been removed, leaving \$74,977 of \$60,850 onbie yards have been removed, leaving \$74,977 of \$60,850 onbie yards of excavation to complete the canal.

B. St insertiable that the New York Central Rullmont's huge accession for fis new retailor, and the insertial retails and the second of the second of the ultimately covered with buildings. An earnest of this is formed in the fact that contracts have been signed for the construction of two large buildings, each of widels will cover an entire city block, the new structures to face on Lexington Avenue, and to be suptimated to the second of the

The contribution of Australia and New Zealand to the British Imperia Nary will consist, in each case, of a crease-tattioning of the same type, but larger than, the "Indesthip," which was present at New York during the Hudson Fulson Celebration, together with three 1-600-ton, 2-8-ton tecourteners, sit torpede-best destroyers and several submarince. Each cruiser-batdestroyers and several submarince. Each cruiser-batteship will cost about \$9,000,000, and each flow tunt about \$20,000,000. They will form an integral part of the British Navy, and will be subject to the regular

The Committee on Riccriffcation of the New York Railroad Club, after a years study of the subject, reports that no general information is available on the basis of which scann railroads as a whole would be justified in electrifying terminals or main lines solving the state of the second state of the second state of the statentian should be given to the possibility of selectfloation in connection with neavy grades, and that it is necessary to proceed with caution in attempting the electrification of large freight terminals, which seems arrily involves the traffic of a number of different

The Committee on Wood Preservation. In a report delivered at the annual meeting of the American Rail way Bugineering and Maintenanceof Way Association was Bugineering and Maintenanceof Way Association for indicate a decrease of the modulus of elasticity of from 10 to 15 per cent for erconsoled timber, an compared with untreated timber, and a decrease of about 30 per ent in the outer stress at elastic limit and at failure. Crecoming appears to have little effect on Douglas for in tension or end compression, but it does weaken it in tension or end compression, but it does weaken it in tension to end compression, but it does weaken it bers show, as a rule, corresponding decreases in structure that the present of the control of the con

In protesting against the granting of any further vanish rights under adsavalls to swares of buildings and principal streets of the city, the Public Service Commission has drawn attention to a most revice Commission has drawn attention to a most proper state of the city and the commission of the city and the country beneath the narrower thoroughfares which are found in the lower portions of the city. The commission states that in Manhattan the practice of spreading foundations beyond the buffing little has already gene so far that much needed space in the streets has been taken, and that if the city enforced gits legal rights, the foundations of some of the large buildings would be affected.

It is gratifying to heart that the latest hattleships of the United States Navy are not only living up to their contract speeds, but in recent 4-hour trials under thill power at forced draught have seen exceeded the original contract performance. The latest instance of this is the case of the "Louisiana," which, according to a dispatch to the Navy Department from Rear Administrational trials and the property of the property of

The recent frightful accident near Green Mountain, lows, it which forty-seven lives were lock through the chescoping of the we wooden three lock through the chescoping of the wooden three locks are considered to the creating and otherwise the sear are subject to the creating and otherwise caches were described to the creating and otherwise caches was drawn by two locomotives which were vunning tender first. The foremost tender frumed the track in a railway cut, and the sengine, wringing around, beams fightly wedged, causaffe the high measuratum of the train behind to be expended in alseacoping into each other the day ceached an analysis of the final title would probably not have joine one-fourth as many.

### ELECTRICAL.

An electric elevator has been installed in the stairway which leads to the cupola of St. Peters Church in Rome, The elevator has a capacity for carrying ten persons. It bears an appropriate Latin inscription

A new combined electric and steam cooking range has recently been patented which is participally adapted for use in hotels. The range is divided into two compartments one of which is heated by nature. while the other is electrically heated. The latter is used for cooking, while the steam is used for hotel the contract of the cooking of the cooking the cooking the overal it is claimed that in this way a steady supply of heat is obtained very excommically

The Brooklyn Rapid Transit Company recently changed the form of brakes used on its care, adopting a "graduated release, quick-recharge" type In order to teach the motormen the best way of thing the new brakes, an air-brake catechian has been issued, and include the property of the continue has been given on the subject. In the mean time a text-book is being prepared showing in defaul how the brakes are arranged and how they should be

The Barila police department is provided with an actenite typereriting telegraph system. There are about 300 receiving stations throughout the city and suburbs. The sending instrument is provided with a keyboard, and when the keys are depressed they cause to message to the printed similaraneously at the sending station and at the receiving station. The object of the sending station and at the receiving station. The object of the sending station and at the receiving station. The object of the sending station and stations are sending stations as the sending station and sending stations are sending stations as the sending station and sending stations are sending stations as the sending station and sending stations are sending stations as the sending station and sending stations are sending stations as the sending station and sending stations are sending stations.

A sets of experiments was recently made at John Hopkins University to determine the dielectric strength of air. It was found that the point at which a brush discharge occurred in only alightly affected by the moisture in the air. From dry air to saturated air there is a drop in voltage of the discharge of less than 3 per cent. An increase of temperature from the freeding point to 40 deg. Cent. caused the lowering of voltage by about 5 per cent. Very erricourly affected the indication of the six affected the lowering of voltage by about 5 per cent. Very erricourly affected the lowering of voltage by about 5 per cent. Very erricourly affected the lowering of voltage by about 5 per cent. Very erricourly affected the louisation of the six of the content of the voltage by about 5 per cent.

"An investigation into the conductivity of electric visualizary was recently discussed in the Physikalische Zeits.hirft. It was found that hard rubber is greatly affected by light, particularly ultra violet rugs and that gutta percha is similarly affected though to to the same degree. Cheunical action appears to take place on the surface of the insulator, which produces a conductive coating. Sealing was and paraffine are also affected to a degree by light, but they are more subject to breakdown because of moliture. The conductivity of wood is to a far greater degree in least of the degree of the surface of the same rod of glass may have parts that differ materially in conductivity. The investigation also brought out the fact that the insulating qualities of all insulators decrease with an increase in ten

About a month age one of the Billoon storage battery care was placed on the Twenty-leighth Sirvet crosstown line as an experiment. The care has been in constant operation since and has required no niterations or repairs other than are common to the ordinary sirvet are it has proved remarkably economical in the consumption of power. Instead of conting two creat and is a mile as was in the sale of conting two creations are the sale of the continuity of the care that the c

A decidedly novel wireless telegraph detector has recently been invented by Prof Rosel of Turin It depends upon the torsional vibration of a fine iron kire, which is acted upon by magnetic lines of force that have a spiral direction. The wire is stretched close to two permanent magnets with like poles adjacent, and is also placed in the center of a coll through which current is passed that sets up a helical flux When the current through the coil is rapidly alternated the wire vibrates circularly; that is, it has a reciprocal rolary motion. At the outless of the reciprocal rolary motion At the outless of the reciprocal rolary motion. At the outless of the reciprocal rolary motion At the outless of the reciprocal rolary motion. At the outless of the reciprocal rolary motion at the outless of the reciprocal rolary motion. At the outless of the reciprocal rolary motion at the outless of the reciprocal rolary motion. At the outless of the reciprocal rolary motion at the current of the collection of the reciprocal rolary motion at the current of the second rolary motion and the collection of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the second rolary motion at the current process of the process of the current process of the process of the current process of the process of the current process of the cur

### SCIENCE.

Mr. Henry Wilde, FRS of Alderley Edge, is providing Oxford University with funds for the institution of an annual lecture as a memorial of Halley

A monument to Horace Wells was unveiled on March 7th in the Place des Etats Unis Paris Wells was born in Hartford Com, in 1815 and was a pioneer in the use of ultrous oxide gas in dental operations. He committed suicide in New York in 1848

We have read somewhere that Peter the Great, when was staying in England, had a particular litting for the companionably of Halloy, and that after caroniam with him at Depterd one evening the wheeled him in a barrow through a year hedge and did such damage that the had to pay handsome compensation to John better the compensation of the compensa

Gold is usually classed among the metals which as soluble only in some regin, i. a mixture of nitriand hydrochloric acids it has been observed however, that hydrochloric acid alone is able to dissolve gold, in the presence of cectain organic compounds which are here arranged in order of activity Methyl alcohol, amyl alcohol chloroform ethyl alcohol, amyl alcohol chloroform hydrate, phenol (carbolic acid) cane usugar glycrelic trictymethylone, formaldehylo The solution takes place slowly in the cold, but in accelerated by heating

The Billiotrological Officest London and the Deutsche March, and Arrillo fine and the Deutsche March, and Arrillo fine and the Deutsche March, and Arrillo fine and the Foundation of Section 2018. The March and September and Se

The Austrian Rinte sub- of radium has been entused to the Brayer-Kas-productives reshible so live Vienna, under the control of the Austrian Minister for Publik Worke Th radium is sold in the form of radium bardum chloride, of three different school, and the sub- of the containing cell, being side known it is packed in cylindrical cells of 21 milli meters dissured and packed in cylindrical cells of 21 milli meters dissured and a millimeters long, formed of which is packed in cylindrical cells of 21 milli meters dissured and in the side of the cells are region of the radium burnum chloride. The cell is recipion of the radium burnum chloride. The cell is required to the radium burnum chloride the cell and in a million, and is a million of the case in the control of the cells are packed in cotton and sheet lead in a small box, together with a certificate braining the number of the cell and the selection. The boxes are sealed a kin strips bearing the numbers of the cells, and are despatially by some the registered packed at the cott and risk of the numbers of the cells, and are despatially by some arguitater packed at the cott and risk of the supplementation.

Unward of twenty different systems of storm signais are at present used by the maritime countries of the world. A uniform international code is a desideratum, and the task of devising one was intrusted necratum, and the task of devising on was intrusted by the international Meteorological Committee to a small runmission which met in London last summer and agreed to recommend to the committee the adop-tion of a code proposed by Frof Moore chief of the United States Weather Bureau. This code substitutes a few simple combinations of the large conical symbols now used at a majority of the European ports for the storm flags bereforce used in the United fixtus and some other countries. Combinations of red and white lanterns are to be used at night to convey the same information as the day signals. The proposed code has not yet however been formally adopted by any government, pending the decision of the International Meteorological Committee which meets in Berlin next September Since the London meeting objections have been raised by the German authorities to the proposed night signals on the ground that they are not sufficiently distinctive and might be confused with other harbor lights. The Deutsche Seewarte at Hamburg is now experi ting with several systems of night signals and will lay the results of its investigations before the cour

## TIMING AN AUTOMOBILE RA

### AN AUTOMATIC INSTRUMENT THAT TAKES THE PLACE OF A STOPWATCH

Even the casual reader has no doubt observed that attomobile records are now expressed in hundredths of a second, whereas but a few months ago it was imsible to obtain any greater precision than fifths of a second, all of which indicates that the use of the

time honored split-second stop-watch has been outgrown in automobile races. When one stops to think about it it is really ab surd to try to time an automobile tra ing anywhere from a mile to two miles and over per minute with an indicator that crawls at a snail's pace around a dial but an inch and a quarter in diameter. In the recent race at Ormend, for instance where the mile record was reduced to 27.33 seconds by Harney Oldfield he was traveling nearly 200 feet each second, which is equivato the length of an ordinary New York block When automobiles were first city block used for racing purposes, they were timed by hand with stop watches. But, wherever an operator is depended upon to snap a stop watch, inaccuracies are apt to creep

in due to the fact that one person is quicker of per-ception than another. The timer must see the start of the tare, and as soon as this impression is received ust start his watch, then at the close of th the same operation must be undergone to stop the watch. The time required for this mental and physi-cal operation varies in different persons, and is known as the personal element. Not only does it vary with different persons but with the same person at differ officient persons but with the same person at other ent times depending upon his mental and physical condition. For this reason, even in the timing of foot races it was long ago found necessary to have three timers and to take the time of the middle watch, for the instruments of the three timers varied s much as three-fifths of a second Early in the history of automobile racing an e

was made to eliminate the personal element by hav-ing stop-watches snapped automatically by the cars themselves making or breaking an electrical contact when they crossed the starting and finishing tapes But, as we have just pointed out, even with the per element climinated, stop-watches are entirely too slow to record the time of so rapidly moving an object as a racing automobile. The experiment of using a chronograph was tried in several of the races last year but as this did not prove very satisfactory, Mr C H Warner of the Warner Instrument Com pany determined to make a special instrument par-ticularly adapted for this purpose This instrument vas first used at Atlanta last December, and has just been employed for timing the Ormond and Days races It works with the utmost precision, is en tirely automatic, and makes a printed record of the race, reading to hundredths of a second. The necessity of such great refinement of timing will be appre-ciated when one considers that the "Lightning Bens" during its record mile run was traveling at the rate of 2118 inches at every hundredth of a second her Warner's instrument consists of four type

wheels, one of which indicates hours the next min ntes the third seconds, and the last one-hundredths of a second. The wheels are operated after the man-per of an odometer instrument.

ner of an oometer instrument. Over the wheels runs a strip of pa per and above that a typewriter ribbon, and a record is made by a hammer actuated by an electro-magnet, which strikes the ribbon and paper against the type wheels. in the circuit of the magnet which operates the hammer is a relay switch controlled by an electro-maget in a circuit that is normally losed This closed circuit is connected with the starting and finish tapes, or with tapes at other points where it is desirable to record the The tape consists of a wire stretched across the course at a height of a few inches above the ground and this wire is connected, to a switch ingeniously constructed to be opened by the shock, rather

than an increase of tension when the wire is struck by the wheels of an automobile. When the switch opens the instruof an automobile. When the switch opens the instru-ment prints a record. The type wheels are frictionally mounted on a driving shaft, which is rotated by an electric motor. At the start of the race they are held stationary, and are not released until the starting wire to depressed, when they print zero and they begin their revolutions. The hundredths wheel makes a revolution entry two seconds. Obviously, the most important part of the instru-ment is the regulation of the electric motor which drives the type whoels it is impossible to construc-a motor so perfect or a storage battery that will discharge so uniformly, that there will be not the slight



An instrument that times races to hundredths of a see-

at variation in the rotation of the driving shaft. However, the instrument is so arranged that at the However, the instrument is no arranges that at two end of every second its speed is automatically checked up with an accurate chronometer. At one end of the driving shaft is a doublearmed lever, and in the path



Switching in the instrument as a car is approaching the tape.

of this arm is a small catch connected with the arma-ture of an electro-magnet. The chronometer acts through a relay circuit to energize this magnet every second, thus moving the catch out of the path of each arm of the lever. The motor



Harney Oldfield approaching the finish line at the end of his record mile run, TIMING AN AUTOMOBILE BACK.

to turn the shaft ever so slightly faster than one turn in two seconds, so that each arm strikes the turn in two seconds, so that each arm st catch just an instant before it is withdrawn. to the base of the instrument at one side is a little "telliale" indicator, forming the armsture of an electro-magnet. The circuit of the magnet is closed when-ever the arm and ontch contact, thus giving the "tell-tale" a slight three every geomet. The operator of the instrument watches this "tellitale," with than on the governor of the electric metor, and it is relitale." indicator lingers too long at each that of the arm and catch he slows up the motor it tribit.

of the arm and catch he slows up the motor a training to whereas if the "millitab" falls to register a capture as speed up the motor slightly, so finds the arm will strike the catch just believe at the moment that the catch is well-driven by the chrocometer in this way a sawy seemers to be the common that the catch is well-driven by the chrocometer in this way a sawy seemers to be the common to the common that the catch is well-driven by the common to the common that the common training of the major to a second of the speed of the chrosometers. It worker to avoid a false sized them to person's walking against or tripping over the tape lines, the timine instrument is one at each of the common training the common training to see the common training the common training the common training that the common training the common training that the common training the common training that the common training the common training that the commo

tape lines, the timing instrument is est set of circuit with the starting lines until just before an automobile is about to teach th before an automobile is about to space Resea.

An assistant gives a signal to the opporator of
the instrument at the proper time, and he
throws in a switch just in time to omtch
the record of the automobile. At the same

time the assistant calls out the number of the automobile, which the operator embre on the paper strip alongside of the registered time. When the car reaches a distant wire, the fact is consmunicated to the operator's assistant by teleph It will be observed that no personal element what It will be observed that no personal element weasawer susters into the recording of the time made by the ma-chines, and that everything is automatic except the regulation of the speed of the motor and the enter-ing of the automobile numbers opposite the seconds they have made

one of our photographs shows Barney Oldfield in his "Lightning Bons" just as he is approaching the finish line The other photograph shows Mr Warner in the timing stand about to take the record of the approaching car

To Bemodel the House of Representative

Because the acoustics of the House of Represents fives are so had that it is almost impossible for th ost impossible for the fives are so and that it is aimout impossible for the Speaker to hear a member of the House, unless that member has lungs of leather, plans have been drawn and all preparations made for a transformation of the lower house of Congress.

For many years now there has been trouble in the House both in the way of acoustics and with ven tion for such a large body, these two principal fea-tures have not been as they should be. The plans in contemplation will remedy these defects, and make the House one of the finest legislative chambers

One of the main ideas to be put into executi the reducing in size of the chamber. In this way it is thought that with smaller quarters, doing away with some of the galleries, and by narrowing the chamber, the acoustics will be all that could be desired. The ventilation will also be arranged to better advantage.

The plans as contemplated also bring the H Representatives in the same fashion as the British
liouse of Commons. In this manner benches and nouse or Commons. In this manner benches and small shelves will take the place of the desks and easy chairs now used by the members. The benches will resemble in appearance the chairs used in the-

aters. By taking away the 4 and easy chairs, it is thought that those members not interested in the debates or speeches will absent themselves from the chambe

The floor of the preber has an area of nearly 5,000 square feet. The floor plan of the proposed hall will only be about proposed hall will only be anou-6,900 square feet. The scating on-pacity of the new hall will be 430, although there are now less than 400 members of the Founs. Some of the lobbles and extyn

Some of the lobbles and extra rooms will be but out, and the re-duction in size of the hall will, at course, result in the reduction of the public galleries, whose seating

it mile run.

Owing to the possible conditions of the hall, with regard to, the hall with regard to, the hall with regard to, the constates and ventilation, many members while away their time by convening with each other in heat tensor or add to the consisting hy alamming their deads or kicking the conjuder, he portnends are being made now for a notesiare sequence of the contract of the contract

### A FINE LONG-SPAN MASONRY ARCH BRIDGE

BY OUR ENGLISH CORRESPONDENT

There has been erected on the new Bellegards-Chiesry electric railway in France a masonry bridge which in span and height ranks as the largest of its type in the country, and which possesses many interesting features The bridge is situated in the Department de l'Ain, and is in close prox

partient de l'Aix, and is in close proximity to the froutier of Switzerland in the easton of Geneva. This imposing structure was designed and erected un der the supervision of Monsirear Picard engineer in chief of the Bridge De partient to whose courtagy we are in debted for the accomplaying illustrations and details, and Monsteur borroad surveyor in chief of the depart

The new ratiread passes through the widest and most picturesses spots of the Jura Mountains and in its location follows the course of the Valerine stream a tributary to the Rhône This revised is troused twire first by means of the Bellegarde viaduct comprising seven spans sends of 60 feet in the clear by 150 feet in height, and secondly b a handsoom smaourry bridge the Moulin dee Pierres or Montangas which has a main pages of 85 feet 1%,

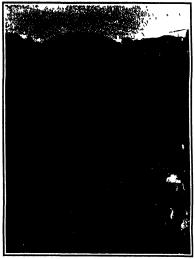
At the latter crossing the river flows through a deep rock zerog, the precipitous banks of which are over 170 feet in height. The rock was found to be of such accellent bearing quality that the engineer in chief decided to use the cliffs as the abutments of a sing from the affect has a fault of 184 feet 3, inch for the are at the intrades and of 177%, free at the actrades I he thickness of the masonry at the key stune is 4 feet 11 inches while the springing 8 feet 3% inches while the pringing 8 feet 3% inches while the springing 8 feet 3% inches while the pringing 8 feet 3% inches while the springing 8 feet 10% inches literassed with the sufficient of provide width for two foot paraments a railroad track of motor gage and a roadway paralleling the railroad track

readway paralleling the railroad track
The eleven small arches which sur
mount the great span on either side
have semicircular energings of 17 foot

have semicircular openings of 17 feet 4½ in hes clear They are carried on piers having a thickness at the top of 3 feet 5½ inches and the sides parallel with the axis of the stream have a batter of 1 in 10 from the point at which they rise from the

Owing to the dopth of the ravine the exection of such a large single span bridge silled for some silled for so

together The towers were each some 145 feet in height and were erected on manoury plezs 15 feet in height built on piles driven in the bed of the stream In treeting the towers it was importative that am ple provision should be made for wind pressure as



Timber fairework ready for the laying of the masonry

the storms which drive through this ravin: an often of attreme severity. This was accomplished by tyme the towers to each other and to the embaniment rack and the pler bases by sirel cables so avaranged as in previde a system of tracting which severed to hold the shole of the talsework preferchy right. The trivial cables are the short of the trackward preferred that the trackward to the trackwa

ing under the superimposed weight and in order to

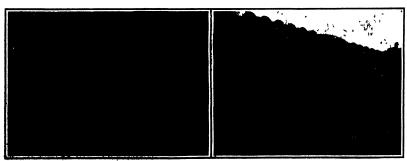
leasen the extent of any deformation from this cause the engineers caused the ionework to be laid in right sections independent of one another which were finally connected together. An acrial cableway was erected across the govern by means of which the

timber piets c ntering and arch were creeded the whole of the material is ing conveyed to its site and set in position by this means

The bridge was commenced in Aug ust 1908 By January 17th of the following year the whole of the timber falsework had be n set up and the erection of the musonry was completed by August 31-t last. When the masonry work was finished the timbering was dismantled. The removal of the centering was accomplished by emptying the boxes filled with sand on which the various parts of the falsework frame timbering sufficiently to cuable it to be The falsework was demoi ished without any movement being noticed in the masonry by November 7th When completed the bridge will excel in span any similar work (xist exter in span any similar work (kist ing in I rance while its height (ver the valley which is equal to that of the towers of Notre Dams in Paris I: greater than that of any other I r single span masonry bridge elsewhere in the world. Its total cost will approxi

According to the Flectik Rallway Journal cay climents with a method of mensaling traction by magnetic wheels have been conducted for some time by Mi O Better of Lawaii Mass. The wheel contains from magnetically out added of which art four segme wheel and a ring of 1 per cent manganess wheels of the service of the service of the magnetic law in the wheel proper to me not the magnetic law in the tenth men of the magnetic law in the magnetic law in the service of the magnetic law of the wheel law attract cd to the null just in advance of making contact with it so that the device be sides giving increased advision also maintain and contact law of the rate and manifest and climater. In courant law of the form each

satisfy write the law strong in classes and resonance along giving in classes and resonance and the resonance and the resonance and the resonance and the resonance and which have been made on a trust with the rail. Twee have been made on a trust with two 1 here, sower few voil stand. The resonance and which have 1000 pounds. With the two 1 here we have been made or railway motors and which have 1000 pounds with the trained must be right about the motors developed a drawing pull of 200 pounds. With the wheele mag notified in the railway for the motors developed a drawing pull of 200 pounds. With the wheele mag noted in the railway for the motors developed in the strong strong and the railway for the strong pounds or more than 100 pre-sat. The invitors does not think to be because the trust have been a strong the railway of the railway



The messary of the main arch was laid in eight independent

The arch has a clear span of 262 feet 95 inches; it stands 217 feet clear of the river.

### OUR MARYELOUS AUTOMOBILE INDUSTRY

If ever an industry has grown by leaps and bounds urely it is that of making motor cars. Even the bleycle in its painted days did not produce machines whose trial value for ten years could equal the truly cap mous sum of money represented by the automobile products made in the United States between 1895 and Mere figures tell but little For that re we have presented on the front page of this is graphic illustration, in which the wonderful strides made in the manufacture of motor cars are tellingly depicted These strides are all the more remarkable when it is considered that the industry had to weather the severe financial depression of 1808, a period which was one of the most critical in the recent financial history of this country

sidered merely from the standpoint of mor (onsidered merely from the standpoint of money, the automobile industry in this country presents a most wonderful spectacle. The total estimated value of automobiles to be manufactured in 1910 is \$237, 000 000 When the industry was born in this country, which was in 1895, the estimated value of the machines turned out was only \$157,000. In the brief space of turned out was only \$10,000 in the ories space where the best with a part of the form the form whose annual product is valued at millions. The intermediate stages between 1885 and 1910 show a growth which is stupendous. The stage from 1895 to 1895 marked an increase in the total value of nearly a mil lion dollars, the actual value of automobiles manufac-tured in 1899 being \$1,290,000 Still more remarkable is the development from 1899 to 1903, for the valua bile product in this country incre Learly sixteen fold in that time, the actual value of at comobiles produced in 1993 being \$16,000,000 Remark this as that increase undoubtedly was it was almost d by the interval from 1903 to 1907, for in 1907 \$105,000 000 worth of automobile may binery was many ato, one one worth of automosic man unsery was manu-factured From the year 1907 to 1910 a 100 per cent increase is to be expected. In other words, in these three years the more increase in value of the automo-bile industry will be greater than the total value of

the industry in the year 1907

An industry which has grown with such startling rapidity and which is valued at so princely a sum, naturally gives employment to an army of mechanics all of them skilled men handsomely paid. Thus w find that the mere wages paid for mechanics in 1910 will amount to about \$100 000,000 The chauffeurs who drive the many cars which were in use in 1910 will carn \$25,000 000 at the very least in 1910

The number of automobiles produced is nothing ort of staggering If all the cars of 1910 were place end to end, they would reach from New York to Pitta-burg, a distance of 438.76 miles. This output of 200,000 is three times greater than that of 1907, considered is three times greater than that or 1907, commonweal from this linear standpoint, for the automobiles of 1807, had they been placed end to end, would have extended from New York to Harriaburg, a distance of 18105 miles Compared with this, the 13.333 extended from New York to harringing, a distance of 19195 miles Compared with this, the 18.33 automobiles manufactured in 1803 seem exceedingly small, although as a matter of fact the machines for that year, had they been placed end to end, would have extended from New York to New Brunswick, N. J. a distance of 29.25 miles. Even this, small as it seems in comparison with the gigantic production of 1910, is high when we consider that between 1896 and 1899 the 670 automobiles produced in this country would have extended only from New York to Jersey City, a dispace of 14 by the stance of 146 miles.

Had all the automobiles made in 1910 been converted itan as the automobiles made in 1810 been converted futo a single huge makine, the result would be, as our frontjuge fillustration shows, a car which would be longer than the steamship "St. Paul," measuring be longer than the steamably "St. Paul," measuring life feet from stem to stem: Preven the output of 1899 had it been thus converted into a single machine, would have been longer than the "St. Paul". The machines of 1803 similarly considered would be been three-quarters as long "The output of 1986 his per output of 1986

Naturally an industry of such Titanic proportions must be capitalised at millions. On the whole, it is safe to say that the actual capitalisation of the automobile manufacturers is about \$250,000,000 The out now there are over 150,000 automobiles in use throughout the country The actual number of employes in the industry is 125,000 in motor-car factories, with employée in paris factories reaching not less than 40,000, a total of 185,000

Hand in hand with this increase in money w Hand in hand with this increase in money value, we find improvements in manufacturing processes. Five years ago, where a man would have paid from \$2,000 for a touring ear, or \$500 to \$1,200 for a runshout he scarcely expected to get much in the way ransions as survey expected to get much in the subserance of un-of durability, or if he did, in the subserance of un-sophisticated anticipation, he was almost sure to be disappointed before he had used the ear many days. When we recorded the automobile runs of those days in these columns, we unually had to recite a series of troubles of various sorts, theny with tires carbareters, ignition devices, as well as breakages and imperfect functioning of valve mechanisms, shafts, gears, chains,

steering knuckles, driving axles, and other vital parts. Contrasting this condition with the results of the Oliddon Tour of 1909, we find that thirty cars to part in that run and finished an arduous trip of 2,640 part in that run and finished an arduous trip of 3,849 miles in 15 days, at an average speed of twenty miles an hour during the daylight running periods, without making a single involuntary stop. That tells the tale of the wonderful technical improvements which have en effected in the brief space of a few years rarely indeed that repairs are made during runs n adays. Occasionally a brake, a carbureter, an ignition system, may have to be adjusted, or a tire may blow

ranem, may have to be adjusted, or a tire may blow out, but the cars operate smoothly and trustworthly. The introduction of special grades of steel, alumin ium, vanadium, and babbit, all of them endowed with definite physical properties recollect. nite physical properties peculiarly suited to the nirements of automobile manufacture, have won fully improved the quality of the motor steel and chrome-nickel steel are now used in crank shafts, transmission shafts, driving axies, driving and differential steering gears, steering knuckles, and similar paris, manganese-bronse, phosphor-bronze, an various aluminium alloys find their places in crank cases goar boxes, steering goar housings, and parts de-manding great stiffness combined with light weight. The automobile industry is very largely responsible

discovery of the physical properties of chrome steel and vanadium-chrome steel under different modes of heat treatment and for the introduction of special tool steels required to work them, and has th indirectly benefited the metallurgical industry of this As a result of the emp steels in the sliding gear sets, by way of illustration, it is now possible to transmit the 40 and 60 horse-power of the modern touring car with smaller and lighter gear sets than were used in cars of 12, 15 and 20 horse-power five years ago, and that with much greater certainty against breakage and the practical elimination of the mangling of the ends of the teeth meshing and of wear due to contact under load. All this improvement in quality, plus infinitely more grace in general lines and in comfort to the passengers, is in general lines and in comfort to the passengers, is offered to the buyer almost at no advance in cost over the impainty, uncomfortable, and poorly-subject care a great proportion of the automobiles manufactured in 190 will be low prized care in The car that could be lought a low years ago if The car that could be lought a low years ago by the man of moderate income required close attention. Automobiling at time was unquestionably a diversion for the rich. Novodays a man of moderate means can purchase thus et acr at an expense that is well within the bounds of reason

In the early days of the automobile industry, the manufacturer was under the necessity of making all his parts, to-day the factories actually making even 75 per cent of the parts that they use are in small pro-portion to the number of producers It is to these changes that the excellence of the menium priced automobile is largely due. There was a time when an as-sembled car was undoubtedly open to suspicion, for however desirous a maker of its parts might be good work, he had neither the knowledge nor the facili ties that would make it possible These annie companies now possesses enormous plants. Their designers and equipment are the best obtainable and their products embody the latest and best in practice, workmanship, and material Assemblers now have at their command parts of a high degree of excellence, and (an buy them at prices fer below those charged for the weak and faulty product of former years.

When a manufacturer turns out twenty thousand ars a year it is not only justifiable but necessary for him to invest very considerable sums in special ma chinery of all kinds that for a smaller output would be inadvisable. One manufacturer has spent \$40,000 or manusance one manuscurrer has specify \$40,000 or dies to produce a rear asks housing, on a production of one thousand cars, the charge against each for this would be \$40 With an output of twenty thousand cars, however, the charge of \$2 against each is little enough for the purchaser to pay for so excellent

A recent development that illustrates the endeavor A recent development that interfaces the endestor to reduce manufacturing costs is the establishment by some of the leading producers of assembling shops at the large centers. To these are shipped parts in suffi-cient quantity to build the cars required for that locleat quantity to build the cars required nor max to-cality, and as there is no equipment of machine tools, the expense is slight. The freight rate on unassem-bled parts is much lower than on complete cars, and the saving effected in time and convenience as well as

the saving effected in time and convenience as well a in money makes the system a satisfactory one. Vast as the automobile industry is, buge as is the value of its output, it must not be supposed that the ed that the value of its output, it must not be supposed that the protest are linglishmate. It is safe to say that the present-day manufacture of medium-priod cars makes no more than a legitimate profit. One of the largest producers stated recently that his predit on a \$1,000 car is less than \$100, surely not excessive when one creations this common investment in makes and appart, his really vast equipment, of, makelue tools, and his labor expense.

sign a car to sell at \$4,000, but that the greatest sits necessary what the selling price is to be less the \$1,000. Perhaps that may account for some of the

\$1,000 Parhaps that may account for some of the decedingly clarer designing in the lever-priod cars.
The scene of the industry has shifted in the years
The scene of the industry has shifted in the years
from 138% to 1310. Much of the early experimenting
in motor cars and early manufacturing was done in
Bufflio, Tarrytown, Marica, N. J. Bridgeport and
Hartford, Chim, Philadelphia, Pa., and other Enters
States. All processors Middigan index all the States in motor-car manufacturing, for that State last year made 112,000 of the total production of cars for 1909. Four other States adjoining it will produce 75,075 ma-chines at least. The Middle West may therefore be said to be the real home of the auton obile industry at the present time It controls not only the car-mak ing industry, but the making of tires, parts, and soces sories as well, a condition which is primarily due to the industrial enterprise of the smaller communities of the Middle West, who have given land and in every way furthered the making of automobiles. It must also naidered that the makers of automatic machiners be considered that the makers of automatic machinery are very largely situated in the West, for which rea-son the better class of skilled labor is there to be found Jastly, the shifting of the industry from the East to the Middle West has been caused in part at least by the fact that the raw material is there put through its first and second processes, as in the case of

unrough 14 mrst and second processes, as in the case or rubber, steel, leather, wood, brass, and the like That the Middie West is undoubtedly benefited by the indux of automobile manufacturers can be shown by the wonderful increase in the population of seme of has doubled and trebled the populations of such of the smaller towns. The influx of 2,000 to 5,000 families has doubled and trebled the populations of such ofties as Flint Micn, and Newcastle, Ind, and greatly enand Newmatis, Ind., and greatly enhanced the value of real estate. Towns which were practically in the control of the control

Cost of Various Methods of Illumination.

The Frankfurter Zeliung publishes the following remarkably complete table of the cost of various methods of illumination

Cost of 100 normal candle hours.

|                                  | Cents  |
|----------------------------------|--------|
| Washington light                 | 0 238  |
| Flaming electric arc             | 0 381  |
| Mercury vapor lamp               | 0 595  |
| Incandescent gas light           | 0 595  |
| Incandescent petroleum light .   | 0714   |
| Direct current electric arc      | 0 942  |
| Ouram, sirron and tungsten lamp  | 1 190  |
| Kerosene burner                  | 1 666  |
| Osmium lamp                      | 1 785  |
| Tantalum lamp                    | 1 904  |
| Incandescent alcohol lamp        | 1 904  |
| Alternating current electric arc | 1 904  |
| Nernst lamp                      | 2 023  |
| Small are lamps                  | 2 142  |
| Acetylene                        | 2 856  |
| Carbon filament                  | 3 808  |
| Argand gas burner                | 3 808  |
| Fishtail gas burner              | 5 950  |
| Stearin candle                   | 26 180 |
| The Washington lamp is an incand |        |

which burns petroleum under pressure

In compiling this table the following average price for fuels and electrical energy have been employed Kerosene 2 38 cents per pound

4 23 cents per pound

According 4 as cents per pound
Seas 107 87 cents per pound
Gas 107 87 cents per thousand cubic feet
Acctylene 809 07 cents per thousand cubic feet
Electric energy 11,90 cents per kilowatt hour.

According to plans formulated by Rear-Admiral Cowles, chief of the Bureau of Equipment of the United States navy, and submitted by him to Congress, wireless apparatus of the latest type is to be supplied wirsless appearatus of the latest type is to be supplied to all the new reseals of the nary, including destroyers and all sutilizations, as this latter class of vessel has proved very valuable in establishing wirsless chains across long structure of coisan without the meessity of disrupting the fighting fleet. Another above station is contemplated at Dutch Harbor, Alaska, to provide wirsless communication to Berling Alasha, to previde whreless communication to heriza Bes, connecting with the Cape Nome station, permit-ting vensule from Nones to lower California to keep in trouch with the world. After the optimizated high-powered station for Westlangton has been completed it is believed station rations with be freed necessary in the following places: The west coast of the United States, the Pannana Cunil Rome, Edwall, and the Philippines. With status, at these places research will be within oull while as, particisally all unstage with the analysematory, of targets to the United Stopics might be expected, "Seek position-ripid sept. States Stopics wight be expected," Seek position-ripid sept. States Stopics

### Scientific American

### Correspondence.

### PFITENER'S MODOPLANE.

To the Editor of the SCHATTIFUC AMERICAN
I have just read with much interest an article in
your issue of February 12th under the caption "A Novel American Aeroplane."

The monoplane has always appealed to me as being more consistent with the law of nature, and therefore more susceptible of continued improvement and event-ual perfection, than the biplane. The double or triple planes strike me as being contrary to the examples set us by Nature, the extra planes being a superfluity of which Dame Nature is rarely, if ever, guilty It would be an incongruity for a bird to be supplied with more than one pair of wings, unless the duplex or triplex wings were accompanied by a Siamese-twin or riphes wings were accompanied by a Siamese-twin or triplicate body. As long as there is but one body and one source of motive and controlling power, a single pair of supporting planes would appear to be all that is necessary if the planes are sufficiently extended to is absonanty it the planes are summing extended to support the body at the speed normal to the bird. Ad-ditional planes do not sufficiently compensate by their increased buoyancy for the increased weight, unwieldiness, and instability I therefore pin my faith to the monoplane as likely to afford an additional illustration of the truth of the Darwinian theory of "the survival

Mr Pfitzner's design, according to my ideas, comes earer to the ideal heavier-than-air flying machine than anything that has heretofore been brought to my attertion. I will be greatly mistaken, and disappointed a

well, if we do not hear from his machine ere long as successfully rivaling even the best of the biplanes. But even Mr. Pfitzner's novel design is susceptible of improvement I cannot help wondering why nother he, nor any other aviator as far as I have been able to ne, nor any other aviator as far as I have been able to observe, has adopted what I consider to be a very essential element of stability invariably to be found in the make-up of the denizes of the air. I mean the invariable disposition of the weight of the body to the supporting planes. Mr Pfixmer seems to have entirely ignored this principle, like all other aviators, by placing his engine and driver's seat above or on a level the supporting plan

Nature, on the contrary suspends nearly the entire eight of the bird below the level of the wings or planes, evidently for the express purpose of securing stability. During flight, or particularly while soaring, the extended wings of the bussard (to adopt a familiar uple) are hold in a plane slightly above the point neir juncture with the body, while at the same time head is lowered and extended forward, so as to bring it down to or beneath the plane of the wings While the bird is sating in a calm atmosphere, the legs and feet are drawn up toward the body, but let a sudden gust of wind strike under one wing and tend a studen gust or wind strike under one wing and result to displace the center of gravity, the logs are at once extended in order to lower the center of gravity, and equilibrium is at once restored. This seems to me to be a wise provision of Nature worthy of imitation as

far as is practicable by the aviator

With the engine, and naphtha and water tanks, as
well as the seat of the aviator, rigidly suspended as fur as conveniently possible below the planes, the weight acts like a pendulum, the plumb-bob of the weagns acts like a pendulum, the plumb-bob of the mason, or the ballast of a ship, its constant tendency being to restore the equilibrium of the planes the mo-ment the disturbing force is removed. And in making a change of direction, if the radius of the curve is a change of direction, it the radius of the three is abrupt, the tendency of the outer plane to rise on account of its increased speed as compared to the re-tarded speed of the luner plane will be measurably counteracted. With the weights so disposed, the ex-tended planes will act like a parachute, and in case of tested planes will not me parameter and in case the sudden breakdown of the engine or propeller would, in conjunction with the usual downward glide of the machine, enable the aviator to alight in an open space "right side up," without damage to either him-

space right sear up, self or his aeroplane were hir Pfinner to raise his planes to the tops of the vertical posts, and lower the engine, tanks, and exet to a level with the axies of the carriage, he would find that much less skill would be required to preserve find that much less anni would be required by pro-peller shaft should remain on a level with the planes, but if lowered just far enough to enable the blades to clear the ground, I apprachend he would be able to make a quicker start. The tendency to drive the plane upward would assist it in leaving the ground, and, once afeat, that tendency, if persisted in, could readily be counteracted by the proper use of the for-ward horisontal rudder, without perceptibly impeding

ward horizontal rudder, without percepting impression the speed of the firer.

I would ruggest another scheme for the rudders. Let them be connected together, so they words sowe in union. When the horizontal rudder is diversed and depressed in order to rise or descend, it would not not not really the percentification of the rudders of

right or left in order to alter the course, it would influence on the elevation of the machine.

I possess but a superrical knowledge of aviation, and I have no means for investigation or experiment, but I have been intensely interested in the science ever since the Wrights' experiments were first made public. The above thoughts came to me as I read and public. The above thoughts came to me as I read and public and the description of Mr Phinner's novel device I make bold to offer them to you for publication if you deem them worthy of being embalm ed in print. Norfolk, Va C E McChure

### THAT NUMBER PURSUE,

To the Editor of the Scheniffo American
If your correspondent in the issue of January 22nd
will study the following figures, be will plainly see
that it is not impossible to get 35 sets of 3 out of 1—15,
so that no two numbers will be in the same set more

| 1 2 3   | 2 410          | 3 611        | 4-9-12     | 6 913      |
|---------|----------------|--------------|------------|------------|
| 1 4 €   | 2- 5-11        | 2 7-12       | 4-13-14    | 6-10-14    |
|         | 2 612          |              |            | 7 8 5      |
|         | 2 713          |              |            | 71114      |
| 1-12-14 | 2- 9-15        | 4 7 15       | 5-14-15    | 10-11-18   |
|         | 2 814          |              |            | X-1012     |
| 11315   | 3 4 5          | 4 811        | G 815      | 11-12-10   |
|         | 2 4 6          |              |            | 6 912      |
| 1 4 5   | 2- 5- 7        | 3- 8-11      | 41115      | 61015      |
|         | 2 810          |              |            | 61114      |
|         | 2 9-11         |              |            | 7 8 15     |
|         | 21214          |              |            | 7 914      |
|         | 2-1315         |              |            | 71013      |
| 1-14-15 | 3 4 7          | 4 913        | 6 813      | 71112      |
| If he v | viii carefull; | y inspect ti | he 30 sets | of numbers |

presented by him in the same issue, he will discover that the numbers 4 and 6 are twice paired, leaving only 29 sets without duplicates

### REBUILDING THE "IDANO" AND "WINISHIPPI "

To the Editor of the Scientific AMERICAN As one of your readers, I have been following with interest the proposals put forward by various genti-men regarding the reconstructing and rearming of the different types of pre-dreadnought battleships in

In the March 5th number of your paper you published a letter from Mr W W Bass concerning a proposed rebuilding of the battleships "Idaho" and 'Mississippi' soss to make them nearly equal to the Louistana" class. One of the objectious put for

clas ss. One of the objectious put ward was the impossibility of establishing a 10 inch gun in a turret built for two 3-inch. Why not avoid this difficulty by leaving the eight 8 inch guns stready this difficulty by reaving the sign sized gains arrows; mounted where they are and then to increase as much as possible the 7-inch battery below? This would make these ships even more similar to the "Louisiana".

I do not believe that the cutting in two of a battle ship would entail very great difficulties as a few years ago a White Star liner was cut in two and a new bow built on the original having been destroyed by an accident. A torpedo-boat destroyer of the Brit ish mayy also was rebuilt in this manner

But if it was deemed too expensive to build this section as proposed, would it not be feasible to sacri fire a few 7 luch guns and re-engine the ships turbines of greater power thus attaining the extra knot and a half necessary to bring them up to the knot and a half necessary to bring them up to the "Louisiana's" speed standard without the cost, time. and labor of totally rebuilding them?

New York, March 21, 1910

(The "Ideho" and "Mississippi" are so much shorter [The "Idaho" and "Mississippi" are so much shortor than the "Connecticut that there would be no room for the mounting of additional 7-inch guns It would be useless to install turbines in these ships without increasing their length and the cost of both chang increasing their length and the cost of both changes would not be warranted by the advantages of addi-tional 7 inch guns and the greater speed secured thereby. The deficiencies in these ships are due to the artion of Congress in limiting the displacement to 13 000 tons -- Ep.1

### Booth of Alexander Assault.

Prof Alexander Agassis died on the steamer "Adri-atic" on March 29th, while on his way to New York Hardly less famous as a scientist than his father, he was noted not only as a biologist but as a mining engineer financier, teacher and man of the world his life he combined the activities of president of Calumet and Hecia Mining Company and director of the Museum of Comparative Zoology at Harvard, founded by his father Prof Agamsis was born in founded by his father Prof Agassis was born in Neuchattel in 1855 and did not come to this country until he was fifteen. His early education was re-ceived in Europe, although he was graduated from Exprard with the class of 1855. He started out in life as a civil engineer, and did much valuable work as senigrant on the Atlantic Geodetic Coast Survey His work in that field naturally drew his attention to the natural sciences. He began to collect fishes for his father, and thus was induced to follow in his father's footsteps. After that his activities were al-most equally divided between scology and mining A study of the copper mines of Peru and Chili led

most equally divined between soology and mining
A study of the copper mines of heru and chill led
him to a survey of Lake Titicacs, and siso to collect
Peruvian relies, which are now lodged in the Peabody Museum at Harvard Five years of his life, from
1878 to 1881 he apont in deep-sea dredging. It is biological survey of the waters of the Gulf of Mexico and

the Caribbean Sea is still regarded as classic His exploitation of the Calumet and Hecla mines to his profit secured the means to gratify his fat ambition, the erection of the great Harvard Mu of Comparative Zoology

He made by his persistence and ability in argument the development of the Lake Superior copper territory on Kewsenaw Point (and now later trace to the mainland) a certainty

### Beath of Hermann Mordebeck.

Oberstleutnant s D Hermann Mordebak died re cently With him there has passed away one of the most ardent advocates of acro-navigation. Thanks to his efforts the Deutsche Verein fuer Luftschiffahrt is ed in its programme meteorological measurements As a young lieutenant, Moodebeck became a member of the Deutsche Verein zur Fordorung der Luftschiffahrt. As a captain he founded in Strasburg the Oberrheinische Verein fuer Luftschiffahrt, and pub the lished its official organ, illustritte Arrosautische Mitchiunnen, now the official organ of all the General organic and the official organ of all the General organic arronautic sorteties. In 1907 Mondelsche was premoted to Observationant A year later he returned from active army service in order to devote his entire time to account the was a mumber of the latera-tional Commission for Scientific Aeronautics and a carrer member of the International Commission of Aeronautic Maps. It was only recently that he founded as a sero Luttfottenveren fuer Bertin und Branden burg. lished its official organ Illustricta Aeronautische Mit-

### Beath of Galen Clark.

Galen Clark, who died in Caklafd Cal, on March 24th, had been known for the last half century to almost every tourist who has visited the Yosem Valley While on a hunting trip in 1857, he discover the great redwood grove at Maripesa. Seen after that Clark devoted much of his time to exploring the upper heights of the Sierra Nevada Mountains, and made known to the world much of the beauties wonders of the big tree groves and of Yesemite

### The furrent Supplement.

In the current Supplement, No. 1788, Mr. P. M'N. Bennie reviews the recent work which has been in the electrical reduction of iron and steel There is much confusion with regard to dyestuffs and the colors which they impart to the textile fabric, and colors which they impart to the textile fabric, and this confusion Prof Otto N Witt seeks to remove Sonse very interesting movilles in toys are described and illustrated Lieut, John C. Solely enhanced to an article on the South Pole will be found mon tioned the various schemes which have recently been put furth to reach the South Pole Prof George E Haiss admirable consideration of solar vortices and magnetic fields, in which be reviewed her become and magnetic fields, in which be reviewed her second study of the sun is concluded Halley's comet is now visible to the naked eye just before dawn in the oasiern sky, for which reason Mr George F Chambers's rough article on this interesting wanderer is published with piculiar timeliness. One of the most important articles in the Supplement is Mr Aston's account of the recent Olympia acro exhibition by far the biggost of its kind which has ever been held in

According to the Engineering Record Improved According to the Engineering Record improved belier performance has been stationed at the Anderson station of the Indiana Union Truction Company by preventing the leakage of air from the sabults around the onds of the chain graties into the flows. This is accomplished by first faling a 4 find outsteadary pips across the formace & inches from the rear of the granulated by first flowing and the control of the granulation. There has some of about 10 inches between the center of the pipe and the rear first perfect perfec the upp of the grant There is a span or about 10 inches between the center of the pipe and the reaffer box wall, which is covered with a course of first-brick. This short provents the passage of air, while the pipe holds back uncobaumed coal until it has been burned into ask, which the grant can earry back under the pipe in one of 1 inch diameter running from one end nearly to the other Cold water is admitted through the small the angle flower and done have the contract of the small pipe and flows back through the large one, the rate of flow being adjusted so that its final temperature is just under the boiling point. The water is discharged in a way that permits its dition to be inspected, into a header delivering it to

### OUR SEACOAST DEFENSES

BY CAPT. H. E. CLOKE, U. S. ARMY

When the Constitution of the United States was framed creating a republicul ferm of government provisions were made for the creatin of military and naval force and for the exist n f

Owing to the fact that access to our cest fertifica-tions has in years past been prohibited to the etit-zens of this country, it is not surprising how few mea-understand the method of fring a high powered gun or a modern mortar For this reason the following de

duty for in case of imminent attack the men sleep at the guns. The battle commander then notifies the fire commanders by telephone of the approach of the fact. The fact would probably be picked up at twa or twelve thousand yards. At this range all the heavy





It set en fo i prote that it stype filesquaring give regid fregen. It can set ally be fired more a lilitet it; I begine en rel 100 protofills at 6000 yards range several lisses Positions of detachment at command "Tond" for 0-inch disappearing rifle.

rapidly The range finder is the eye of the system white the teles hone and telestograph are its nerr The hitting power of a batt ey absolutely depends upon its range finder A range-finding room. (B' station)

No better service could be send red to the country and there is no service that should a peal more to the particular of our State troops than this and particularly the troops of those State which border the coast to I defended Our organized State militia and the various labor organizations should be at tracted to the subject of coast defense for the rosson that men in such organizations are unable to leave that me in anh organizations are unable to leave their families and business interests and entitle their families and business interests and entitle general strike in time of war. If they were organized the as a distinctive tores for the protection of their homes against invasion the defensive force of the little and conting would be in reased by a body on n cf a high ord r cf patristism and intiliges we What one contingiates the cost our costs difference cirtainly do appear to be an expinate investment ber occample a Little gun complet cents such as 1416 000 and as their are about our bundred of those, was mounted in our coset forts the cost of the

guns mounted in our coast forts the cost of the 12 inch guns alone amounts to \$17 000 000. On the other hand we must remember that this sum does not equal the cost of two Disanoughts it costs about \$600 every time one of these guns is fired with an armor piering explosive shell but one of these shells if directed at the proper point on a modern battleship will inflict hundreds of thousands of dollars worth of will inflick hundred of thousands of dollars worth of damage. Although one submant in mine charged with a hundred pounds of nitre giverine costs about \$700 is may it regioned understate a battleably send many millions of dollars to the hotions of the sax On the oth 1 hand the life of the 12 land pure without refilling to only about 250 pounds that is to say far ing one shot every thirty seconds the time of file of a 12 inh 1 life ) the pure becomes unclose after a two hour edgagement.

scription illustrated by the different drawings is given let us consider the enemys fleet to have been sighted on the horizon and headed under full steam in n tormation for the entrance of a harbor attack is being made during a late hour of the night On the discovery of the leading ship by the powerful



It all the telescope of it is hadronect for vertical and bords real later. As it is epople: if the liverage is released in its most part is the later of the later of the later of the later of the part is core and its whitch ages had it is yorder. Fragge of it proval not interested to the later of the later of the later of work time if a sality it effort of term is the most as it is resulted in the later of the (1 Ma) I redwind the consist stifflings company

Lowis position finder.

searchlights of the defense the battle commander directs the sounding of call to arms. Within ten seconds every soldier is at his station or post for

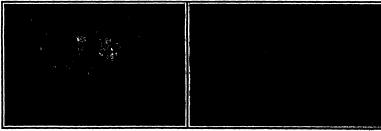
batteries including mortage are directed on the lead ing ship The probability of hitting her by this means would of course be greater than if the fire were dis would of course be greater than if the nre were dis persed All guns attack the side armor and turrets of a battleship while the mortars attack the decks. The searchights of the different fire commands are now concentrated on the leading ship while the battle

now concentrated on the leading saip while the battle command lights are searching for undiscovered ships in order to fire a modern 12 inch gun the following data must be accurately determined. The elevation to be given to the gun (which is a direct function of the range) and the amount of & forcion to be set on the sight if the gun were merely

Section to be set on the sight. If the gun were merely set for the range from the grun to the target the probability of hitting would be very small. The errors that enter into the range mention are as follows:

1. The accelerating or rotarding component of the wind 2. The variation of the height of tide 3. The variation of the height of tide 5. The variation of the resistance offered by the sir due to its density 4. The variation of the initial velocity of the provider due to imperature or other causes 5. The change of the range due they have been considered with the property of the provider and the component of the provider and the change of the range due they consolidated by the has seen with highlightner randitive. It is economically the that we carge: I nowe corrections must be applied to the range with lighting rapidity it is accomplished by the use of certain mechanical contrivances which are located in the various fire control stations of the fortress. The deflection correction to be set on the sight is

The defection correction to set of the single is the algebraic sum of the component of the wind the drift and the speed of the target and it is determined by means of mechanical devices located in the plot ting rooms. The following then would be the method of determining the range and delinction to he sent to the guns by telautograph or telephone At the simultaneous ringing of the bell in the primary



R is in this room that specially trained men betermine from data received from the range fi the course of a tar, t and its predict algorithm. This predicted range is sent to the g of a battery as i by the ring. f a bet the predicted them is senomered and the gran fire by elevit platt determine.

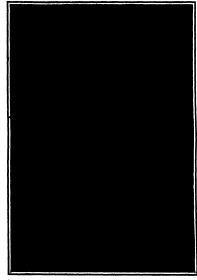
of with a 1/10-per Science of C

A plotting device.

Positions of detachment at command "Posts" for 12-inch meriars,

### Scientific American

I accordary grations, the observers the instruments read the satisficth gies at the base ends. These angles immediately plotted on the plot are immediately plotted on the plot sing board, and the position of the tar gut with reference to the centre of the gun is determined. At the expiration of 15 seconds, the bell again rings, and the target is again plotted. The course of the ship is then accurately deter-mined and, by means of a mechanical mined and, by means of a mechanical device on the gun arm, the amount the target has changed in azimuth, due to its speed, is determined. The last range read is now set on a device called the range board. This device is prac-tically a grapplic adding and subtracting machine. The corrections above remachine The corrections above re-ferred to for atmosphere wind, tide sto are here applied, and the resultant correction (a reference number) is set off on the gun arm of the plotting board, and corrected ranges are now sent to the gun by telephone or telauto graph This range is called the cor-rected predicted range to the target. It is predicted for an interval of 15 or 30 seconds ahead It is now plugged 30 seconds ahead It is now plugged in on the time range relation board which is in full view of the range keeper at the gun The range keeper thesepe the range disk continually set at the corrected range (as observed on the time range rolation board) such that the gun can be fired at any time The deflection correction is obtain ed bs The deflection correction is obtained by the use of a device called the deflection board. This as in the case of the range board is an adding and subtract ing machine which determines the flection to be set on the sight due to wind drift and speed of target. The drift is determined by ballistic cal rulations, and the curve is constructed on a metal leaf on the brard. The velocity of the wind is determined at the meteorological station by means of an anemometer and is received at the tting room by means of an electrical device called the peroscope shown in



Droups of these deadly reapons of destruction are planted across channels to keep the sceny out. To are startless to freeding super sout are extendly controlled in an extensive conflict on the first first report of the controlled and the startless of the startl

(Bedrawn from Loke s The Gunner a Francisco ; ublished by J hu Wiley & H ms.)

the drawing The asimula of the wind is also west by the same means. The components in the direction of raspen and deflection are determined by means of a derive called the wind component indicators above in the picture. The atmosphere correction in determined in a time neterorisquial station and is such in over the aeroscope. The hight of windly correction is determined by a device called the powder that!

Owing to the fact that there corrections in the control of the correction of the control of the correction of the control of the correction of

Owing to the fact that there corroctions may be either additive or subtractive and that the use therefore, of
a negative sign tends to confuse the
resolution of the superior of the
resolution of the superior of the
resolution of the superior of the
rectual values but by means of refer
nene numbers. The reto of the sight
for example is the number 3. The
gumer at the sight these tons would
receive a defloction lifts this 4.5. Ho
supply sets his sight to resolve would
receive a defloction lifts this 4.5. Ho
supply sets his sight to reach this de
supply sets his sight to reach this de
rectify atmed. It is to be understood
that all these fine control instruments
and stations are located at concurs
and stations are located at concurs
and control. They are connected with
each other by either is replaced in the
superior of the superior of

The fire control system of our cone strillery is also very fisible. If the horizontal base system falls care ho serving instrument at the primare of the system falls care on an except size of the system is no arrange finder and the system is not as a supply all the game with the accessary data for fisting thus but the accessary data for fisting thus but the first finder of the stations in cluding the fire commander a should be

(Continued on pay 3x6)



This diagram shows it is passed very the attrasparant of an updo-this instance. The position of the entry is found by observing the engine the ship makes at two observing stations IF and IF attracted at the cit of a common has fine of larger learns. There exists are inhabitant to the nicitize poon where the position of the ship is found. From the pointing room the proper elements, etc. it intercheased to the cit.

Pres decring by Marier Ottore Erdys,

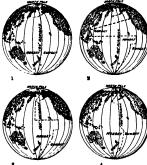
### OUR CIVIL DAY

### ITS ARRIVAL ON AND PROGRESS AROUND THE EARTH BY DANIEL ARTHUR

A few generations before our era the "whole known world was only some 2; million square miles in ex-tent instead of nearly 200 millions as we now know. That great observer and geographer Fratosthenes made a noble mitempt about 225 H. C. to draw a map of the "World". It even used lines which looked wave likeparallels of latitude and circles of longitude. These lines were largely based on the speed records of much me and hence were not very accurate There were no such refinements on his maps as international date lines or time zones. His general outline of the 'whole world" was about 90 south It was all above our equator, and extended only about a quarter of the way around the earth The month of the Ganges was farthest east and what h now belond was farthest west. The Cas-plan Sea was thought to be an arm of the Northplan Na was thought to as an arm of the Nord-era (Kenn, while the lower and of the Red Sea was shoult the southern Hmit. Knowledge of the rest, of the world grow very slowly then, as was shown by the fact that the great Strabo dre a map of the "World two hundred years later (about 25 B C) and made no material extension of its lines. He pushed Great Britain and Ireland farther west and made some radical changes on the northern edge of the Mediterranean, but other

the northern edgs of the Mediterraneon, but other whee those two maps of two hundred years agard are practically the same. There is very little doubt, however, that sixthoo though the world to be round, before he died. Hence, the encessity for a date: Hen was fit even at this early date. With the spherical carth these was questing through its hundreds of years of recisioner some radical observers starred it spinning on its axis so to speak. They were bold men, but they proved their case. This brought the date line as a nece Insir rease. This brought the date line as a necessity closer to us. It would almost seem that with a flat disk world" converted into a stationary globe, and hier into a rotating globe the date line idea should have suggested itself at once. Not so, however, for it appears that when Magellan crossed the Allainte from the east be Magnism trossed the Atlantic from the east he passed around Sunth America crossed the Pathi, discovered the Philippin Islands, and went home around the lower end of Africa thus completing a trip around the world. This trip was made less than four hundred years ago, yet when the explorers arrived at their home country they were astonished to find that they carried a date on board their ships which vas a day earlier han the home date It was soon found that no mistakes were made on the log books as to the fitne records and that the home calendar was certainly correct. The explanation of this seem

to a set of questions sent by the writer. The man, together with the questions and the answers, will be found on a recent Paulin thant issued by the Navy Department To describe the line, commencing at the northern end, it will be seen that the first deflection of practice is to the cast, to give the tip of Siberia the same date as the rost of the Russian om-



Theoretical date line # Date line when Alaska took date of Busela and Philippines took d to of Pipelin | 5 Date line after purchase of Alaska and Philippines took Asiatic date | 4 Prosent International date line

### Fig 1 -The evolution of the international date line

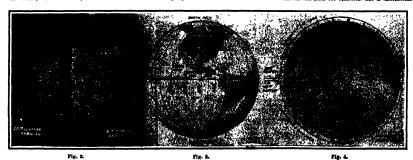
pir Then after the line passes through Bering Strait it beers to the west, crossing the true line of 180 deg and far enough beyond it to take in all of the Alcutian Islands to the American date, after which it turns back to 180 deg, where it stays until it cros lurns back to law deg, where it stays until it crossess the cquater a few degrees, at which point it again deflects eastwardly to give the Tonga lalands the date of Australia The line then returns to the 180th meridian and continues on that line to the south

The foregoing is the 'international date line' of

1948, to bring those islands into accord with the date of the countries east of the Cape of Good Hope. When Alaska was accrited by the United States, the data line was transferred west of that territory or late Bering Stratt. These two radical changes made being of practice look more like the third diagram in Fig. 1 Reter to Fig. 3, which is intended to show the entrance of time on our globe. The picture illustrates a mechanical dislevery of our civil day, month, year, or century by means of an equa torial tage. Let us assume that the earth is stationary and that this tape enters and departs under the date-line reliers as shown. If the tape had a speed of about 1,640 miles per hour and was properly marked in hours, days, months, etc., it properly marked in hours, days, months, etc., it would show just how our civil day enters the earth would show just how our civil day enters the earth and progressee around it with a constant motion. The illustration shows the front and of the twen tiche century as having completed is hours of the first day on earth, leaving only 8 hours of the minecessith century to gittle coward the line and off, to no one knows where The front end of the control of the contro minute and January 2nd growing broader at the same velocity. This of course is assuming that time is entering normally and not by the arbitime is entering normally and not by the arbitrary intermitient stops that we will call the twenty four way stations of our civil day. This latter system is in successful operation in the United States and two or three other leading nations, China being one of the more recent converts to the hourly sone system.

veris to the hourly some system. Fig 3 shows the earth with the hourly time belts or somes outlined from pole to pole. The line drawn are 15 deg, apart and represent the boundary lines of those zones and spit their centers. Fig 4 is the same outgable as viewed from the north star In the lillustrations the United States are continued in

approximately the correct location, so as to show the theoretical boundary lines of the hourly zones as amplied to that country love to the hoursy somes as applied to that country Now in these two illustra-tions let us assume that the system has been adopted in all parts of the world Commencing with the prime meridian at Greenwich as the center of a some bounded by lines 71/2 deg east and 71/2 deg west, the comple-tion of such a set of lines would give us just what is drawn and what our United States are actually using in theory To illustrate mechanically the delivery of time on this plan, our equatorial tape is intermittent



How the twentieth century was makered in -a mechanical parallel. OUR CIVIL DAY-ITS ARRIVAL ON AND PROGRESS ABOUND THE EARTH.

ing impossibility was soon forthcoming, and our date line was been in fact

As no one wanted the line near his home or coun As no one wanted the time near his nume or country, it was put in the most out of-the-way place possible, where it still stays. The 180th degree meridian is in theory where each new civil day is born, but in mractice it has never been strictly adhered to. Fig. 1 practice it has never been strictly adhered to Fig 1 diagram 4, shows its location with the deflections of practice as they new exist on the official map at Washington. This map was made by the Hydrographic Office of the United States to illustrate its replies

practice at the present time, but in former generations the deflections were considerably greater, as for complet the one shown in the second diagram of Fig. 1 in this date line Alanka was taken into the day of Russia, to which supply all formarity belonged. The line there took a westerly away of throusands of miles to the contract of the contract to take the Philippine Islands under the date as written in Spain This latter wide deflection was afterward turned back or corrected by the action of the Covernor General of the Philippines when he decreed that Documber Sizt, 1844, be recknowd as January ist,

in its action, that is to say, it jumps 1,040 miles and then stands still for an hour, which means that on the twenty-fourth jump on any day of a given name, that (Continued on page 207)

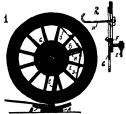
\*Rates writing this writes it has come to my notice that Child of Stock Assertin has given up local time which was I'm minotes about of Thistestes sectors now and, to quete the Recordingle Joines, the Chillians were realed to live the same I'm sincess to be over The decision were consolated to live the same I'm sincess to be over The decision were convoluted to live the same I'm sincess to be over the decision were convoluted to live to get an Assert I'm A see a given they are admitted, it will be a seen of the same and the same and

### Scientific American



### NOVEL AUTOMOBILE PUMP

Pictured in the accompanying engraving is an inreceived in the accompanying engraving is an in-teresting form of pump, that may be used for inflat-ing an automobile tire. The device is arranged to be operated by the automobile itself. It consists of a base A, on which is mounted a jack used to rates an operated by the automobile itself. It consists of a base A, on which is mounted a jack used to raise an automobile axie so that the wheel will clear the aground. The base A carries a since B, which is de-signed to assist in positioning the automobile wheel with respect to the pumping device before the jack is operated to raise if The pump is indicated at O, and is mounted to rock on a bott J. The pump ton B in connected to the automobile wheel by a device above alonging in the consecutional view (Fig.



MOVEL AUTOMOBILE PUMP

A slotted plate F is provided with teeth adapted 3) A stotted plate F is provided with rech asabted to engage similar tech on a slotted plate G The plate G is provided with a crank pin, to which the platon rod E is connected The plate G is provided with an apertured extension, adapted to fit over the axic of the automobile wheel The plate F is attached axle of the automobile wheel The plate F is attached to one of the spokes of the wheel by means of a hook H while a pair of hinged braces J are used to connect it with two more spokes of the wheel In this way a rigid connection with the wheel is secured By loowening the thumb nut on the book H the plate F may be moved up or down on plate G so as to adjust the parts to wheels of different sizes. The distance from the crank pin to the center of the wheel however, is fixed In use the automobile engine is operated to rotate the wheel, and this action carries the piston up and down in a cylinder, the latter rocking back and forth to accommodate itself to the lateral throw of the crank pin A flexible tube connect the pump with the tire that is to be inflated. By this arrangement a tire may be inflated very rapidly, and the inflation carried to a further degree than is pos-sible by the manual operation. By using a speed at tachment of any of the well-known types, the burst ing of tires due to excessive pressure n This inventor of this automobile nump is Dr Richard A. Goeth of San Antonio, Texas.

### COLLECTION BOX FOR MAIL CHUTES.

Collection boxes at the termini of mail chutes are frequently filled to such an extent before the mail is removed that when the collection is made the mail es out of the box on opening the box door as tumbles out of the box on opening the box door and falls to the floor in spite of every precaution taken by the collector To better this bethersome condition a box has recently been devided which is provided with a platform having foldable side walls that permit the platform to wing downward when the door of the box is opened and serve to prevent the null matter from falling from the lox. The countraction of this



COLLECTION BOX FOR MAIL CRUTES,

box is clearly shown in the accompanying engraving Fig. 1 shows the box door open with the platform A swung down horizontally The platform is provided with two side wall plates B rigidly secured thereto with two area wan places B riginly secured increase and a series of sector shaped plates C. Near the for-ward edge of each of the plates B and C is a groove D adapted to receive a pin mounted on the adjacent plate, while at the opposite ends the plates of each side wall are mounted on a common hinge pin This permits the side walls to close up somewhat after the manner of a fan to the position indicated in Fig 2 The innermost sector C is provided with a lug E, which the outward swing of the platform A To prevent the letters from dropping between the sector plates the top of the box is provided with two guards F which extend below the upper edge of the plates. In use when the platform is lowered the letters in the box will turnble out through the door opening and will be caught by the platform and side walls. The inventor of this collection box for mail chutes is Mr R E Edwards. care of T J Kelly, 29 South Eleventh Street, Lincoln,

A REW SOUNDING BOARD FOR FIANCE.

The woul of a plane is its sounding board. The mounding board is composed of wood carefully select That and carefully seasoned, so that it will remain constant in quality for the many years during which a plane It is arched or crowned against the pres is used. sure of the strings so that the strings and the s ing board may vibrate in harmony As the plane ages the sounding board flattens. In an upright plane this flattening is accompanied by 'buckling back" or tracking The result is that hard metallic so-tailed "tin panny, tone so characteristic of old planes It is obvious that if some means were provided for permanently arching the sounding board against the pressure of the strings, the plane ought maintain its tone for years without any tendency

of the sounding board to sag

The attempt has been made frequently. Some success has been attained in grand planes by the em ployment of tension rods radiating from a center hub to the sounding board rim, but so far as we are aware no one has ever successfully equipped the upright plane with a sounding board so constructed that it would not lose its arch in time. A sounding board type which has been successfully applied to an upright plane has recently been inver B Long of Los Angeles Cal and is lilus

trated in the accompanying engraving
What Mr Long has done can best be understood



TRUSION DEVICE FOR PLANO SOUNDING BOARDS

when we consider the true function of the sounding board of a piano. The sounding board serves to sus-tain and amplify the tone produced when a hammer strikes the strings. Mr Long has increased the tone sustaining and amplifying quality of the sounding board by flexible reinforcing means interposed between the sounding board and the sounding board frame, thus equalizing the flexibility of the sounding board and at the same time maintaining its relation to the sounding board frame, so that the greatest pos-able vitality of the sounding board is insured. From the accompanying illustration, which shows the front of an upright plane with Mr Long's sounding board position, it will be observed that the edge of the ln po posts interposed between the edge of the sounding state of the sou beneating effect, the pressure post serves the additional pur pose of maintaining the crowned sounding board in its original form. The back frame supporting the its original form its original form The cack trams supporting toe sounding board is reinforred by diagonal tension rods placed across each corner, as shown in the illustration The edge of the sounding board is rabbeted and gived into a continuous laminated rim built up of

hard maple veneers or layers so as to produce an

exceedingly strong construction, which, however, is sufficiently fiexible to yield under the pressure posts, with a view to equaling the outward pressure on the sounding board resulting from the stretching of the strings over the surface. By the use of screw pres-sur-posts, any shrinkage or expansion of the sound-ing board and the rim can readily be equalized so as to preserve the tone and even to amplify it. The arrangement is such that a proper reflection of the vibrations of the sounding board is obtained, as the strain on the sounding board by the strings is equalto reflect the tone

As a result of this new combination of sounding board rim and pressure posts a small upright planu can produce a tone which is comparable with that of mall grand plane, and the full round tone of the w upright piano is preserved because the sounding board is maintained in its original arched post-

EDUCATIONAL APPLIANCES FOR DISPLAYING ORIECTS. In the instruction of projection mechanical draw-ing, descriptive geometry, etc., it is important to be



EDUCATIONAL APPLIANCES FOR DISPLAYING CRIECTS

able to show students a skeleton model of an object. large enough to be seen by an entire class, and which will show front and side clevations as well as plan and bottom views. Heretofore this has been done by using a glass box within which the object was place using wire screens for the sides of a box, which per mitted the teacher to chalk mark the outline of the object. An improvement on this system is offered by the invention illustrated herewith it consists of a stand provided with axes that have automatic stops at quarter revolutions to arrest the model in various positions The apparatus comprises a vertical shaft A. on which is mounted a table B that carries a support C provided with a pair of upwardly extending arms support C has in its lower face four recesses adapted to receive a spring pressed stop pin D. The recesses are positioned at quarter revolutions of the support. unted in the arms of the support is a shaft on streament in the arms of the shaper is a search owner.

If a research the square blocks E and F The block
E is formed with four recesses adapted to receive the
H four the blocks are adapted to receive a clamp
If that carries the display stand J Model K is above
upported on the stand. Fir display stand may be
moved about on three axes which are fitted with index wheels so as to incline or turn the model about to any desired angle. The inventor of this educational appli ance who is My Hermann Hanstein of 2019 Mo Street Chicago, Ill informs us that he has used this display apparatus effectively in his own clas

### IMPROVED DETACHABLE WINDOW VENTILATOR

The ventilator which is illustrated in the accompanying engraving may be detachably secured to the window casing so that the window may be opened a short distance to permit the sutrance and escape of



IMPROVED DETACHABLE WINDOW VENTILATOR.

sir Furthermore, the ventilator is provided with an automatic damper, which acts to prevent the entra-

of unusually strong currents of air and is fitted with

shaped in section, and is fitted into a bracket at each end secured to the window casing. The lower edge of the casing is provided at D with a lip that engages the sill of the window Extending lengthwise

engages the sill of the window Extending lengthwise of the ventilator is a bar C, which is formed of about metal bent back upon liself to form a holder for two packing strips. I and R which extend to opposite directions: The packing strip D is adapted to fit against the saids of the window, while the other strip across as buffer for the damper. At the opposite side of causing ther I has a vertical reteation P which serves

as a baffle. The screen of stretches from the base of this extension to the bar C, and serves to keep out foreign bodies that may be drawn into the ventilator by the blast of air. The damper is indicated at H, and consists of a plate bent back upon itself at J to form a reinforcing bar while the inner end K is weighted so that the damps r will normally come to a balance on the axis L. When the window is raised the damper swings to the horizontal position as indicated, but if a strong draft blows through the ventilator it will strike the under side of the inner part of the damper, lifting it up until if the wind is strong enough, it strikes the buffer E. When the window is closed it

TENONING MACHINE.

a buffle which serves to keep out rain or snow casing of the ventilator, as indicated at A, is qua

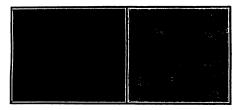
### Scientific American

the end of the sist. If a large tool is used all the weed will be cut away except a single tenon, but if a smaller tool is used a central tenon may be cut, leaving enough wood projecting at each end of the sist to form enough wood projecting at each ean of the state to re-two more known. In this way a sist with three tenens can be formed, and by properly choosing the size of the tool and laterally adjusting the pedestal the sist may be formed with two tenons. The inventor of this sist tenoning marchine is Mr José Ojanguren, Calsada del Monte, No 358, Havana Cuba.

### IMPROVED JACK BLOCK

When the tournal bearings or brasses of a railroad

with the secondary star wheel F. The princip at secondary star wheels L and F are locally instituted collars on their remoutive shafts, and are housed becollect on their respective means, and are some se-tween separators H in such a manner as to prevent them from shifting thereon, yet leaving them free to rotate with the shart whenever it may be incommany for them to do no to ring the bell-ringing mechanism. The star wheel L is provided with teeth on its pari-The star wheel L is provided with teeth on its per-pherr, which teeth are adapted to engage rods project-ing from the star wheel N, whenever the star wheel L is released by the angle tripper JK. The teeth of the star wheel L engage a slide O, connected with a retractile spring-controlled clapper PQ, which rings



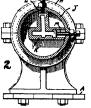
IMPROVED JACK BLOCK

illing it up that I the wind is strong enough it is strike in the biffer F. Whin the window is closed it positively close a the damper by bearing against the notice section I. The brackston which the casing is mounted are extensible so as to permit of using a standard length of ventilator with windows of different size. Each bracket is formed with a spring extension A, provided with a lug which is adapted to engage a stop pin on the window sash, and prevent car become worn it is necessary to lift the journals by means of jacks so that the brasses may be removed from the car axlo, and be replaced with new ones the window from being raised too high. Should it be desired to raise the window further it is a simple matter to withdraw the spring catch M The inventor of this ventilator is Rolla M Hill care of the Economy Ventilating Co Metropolitan Tower, New York The machine pictured herewith is designed to cut

When operating the jack it sometimes happens that the car wheel is lifted with the journal and derailed The purpose of the invention illustrated in the acsanying engraving is to provide a devi cylindrical tenons on the end of a wooden slat, particularly for use in window blinds. Window blind slats

will hold the wheel down while the journal is being will hold the wheel down while the fournal is being lifted, and form a level surface for the jack to rest upon The jack block is preferably made of malleable cast iron or steel, and is constructed in the form of a grating with the edges scalioped or corrugated so as to insure light-

ness without un duly weakening the stucture. At one end the block is provided with an ex tension B, terminating in toe C, which is adapted to fit over the rim of the car wh The lack black is rested on one of the sills of the ties of the inck in seated on the upper face of the block.



TRECKING MACRIMA

usually are provided with a single central tenon, but there is another type in which two tenous are used, and sometimes the slat is provided with three tenous. The machine is designed to form any of these types of slats. It consists of a base A provided with a central siats. It consists of a base A provided with a central bracket B formed with two barings C in which is mounted an arbor shaft. The arbor shaft is provided with a pulley B between the bearings, and may be fitted with tools, such as shown at P and G which depend for their form upon the nature of the work which they are to do. Opposite each end of the arbor shaft is a pedesial H fitted with a head J. In our illustration the head is broken away at the left hand side of the machine to reveal the interior construction. A cross sectional view of the head is also shown in Fig. 2 The head is formed with an interior web K, and the web is formed with a pair of channels that intersect center of the head At the upper end of the vertical channel and at one end of the horizontal writes channel and at one end or the horizontal channel is a spring such as shown in Fig. 1, which may be adjusted by means of the screws L and M, to bear against the work which is placed in the slot. It will be understood that the head J is revoluble within the pedestal H. The pedestal is connected to the base A by means of a pair of boits which pass through slots in the base plate thus permitting of a lateral adjust-ment. In use a slat is inserted in one of the channels in the web K, and the end of the slat is brought into in the week, and the end of the star is brought into contact with one of the cutters on the arbor shaft. The pedestal is adjusted laterally so that the center of the stat is out of alignment with the axis of the tool and then when the stal is fed against the tool and the head J is revolved a chreuker tenon will be but in

close to the ex tension B When the journal is jucked up the one serves to hold the wheat to the nil, relieving the upper journal bearing of the which the proper journal bearing of the wide of the proper journal period of the proper journal period of the proper journal period in carrying the block about a handle D is arranged at each aid of the body of the block, the location being such that the block is belanced when lifted The inventor of this juck block is by James Allen Gray of Gour of this juck block is by James Allen Gray of Gour d'Alene, Idaho

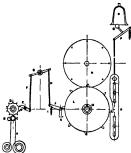
RINGING CRIMES BY PERFORATED MUSIC SHEETS. One of the pioneer inventors of the automatic plane player, Mr John McTammany of New York city, has ed a system of ringing chimes of bells by per forated paper music sheets, such as are employed in piano-playing mechanisms. Mr McTammany's scheme piano-playing mechanisms. Mr McTammany's scheme was evolved as part of a huge memorial to be erected to the memory of the men who fell in the civil war The memorial assumed the form of a monument in which each State was to piace two bells. To ring so extensive a chime by hand would obviously be a task categories a crime by nand would obviously be a task involving superhuman muscular power, Even the present mechanical and electrical methods would probably fall because of their complexity Hance, Mr McTammany devised the very ingenious system which

is here illustrated
The perforated music abset A is guided by a roil B,
and passes over a grooved roil U. The plus of a diriing wheel D are adapted to engage the perforations of
the music about A. The pin wheel D is operatively
connected by means of a 60g E, a coanceting red J,
a rook half U, a connecting roil J, and a name tripor JE, with a primary step, yebest J, which, coance

is here illustrated

the bell R The several shafts illustrated are gen

the boil R The several shafts illustrated are geared together in such a manner as to cause the several parts to ecoperate in definite order A tooth of the wheel D having entered a groove of the feed roil G through a perforation in the music sheet A, the wheel D turns on its shaft. In se doing it engages the dog E, which in turn through the conit engages the dop g, which in turn through the con-necting road p and H trips the angle tripper JK, thus releasing the secondary star wheel L, which, by the friction of its shaft, rotates into ongagement with the slide O, thereby pulling the slide down and withdraw-ing the clapper from the bell When the slide is re-leased by the Lewth of the star wheel L, the retractile spring of the clapper is released, so that the clap-per deals its stroke and rings the bell as the paris return to their normal positions. The wheel D strud-dies the feed roll, and is prevented from rotating ex-cept when one of its tooth fits into a perforation of



RIVOTES CRIMES BY PERFORATED MUSIC SERBIS.

the sheet and into the grouved roll, which turns the

primary star wheel one degree.

The playing of the bells can be giverned by clock mechanism, so as to strike the quarters and the hours and to play airs at stated intervals.

A new form of manying informpoor has recently been invented in which there are not reciprocating parts. but the interruptions are produced by a ripple formed in a sirean of parentry. The mercury is excluded in a reversing vessel within which a contact-piece is fixed. The mercury is theoret by contributed norse to the inner periphery of the wessel. At one point the stream of mercury is obliged to pass overy a dedector, precluding a ripple or wave, and the contact-piece his fixed to the mercury in the stream of this point is reverse with the wessel. The requires yet this fixer reverse with the wessel fix requires with the sensel. The requires point in the same directles as the vessel is revorted above in the same directles as the vessel is revorted above.



## It is Easy to make advertising

claims for cars; but to make cars that will make good the claims is hard.

We ask automobile buyers to do this: After the advertisements have attracted your attention, then in fairness to yourselves and all the manufacturers, compare the cars point by point. That is all we ask.

There are Chalmers dealers in all parts of the United States—more than 200 of them. We suggest that you get in touch with the one nearest to you at once. Let us send you his name if you do not know him.

### Chalmers "30" \$1500

Judged by price alone you might as well buy some other car as a Chalmers: \$1500 is simply \$1500—no more in one bank than in another, no more in bills than in coin, no more in your pocket than in another man's.

It is only when you begin trying to buy something with your money that the sense of value enters your mind.

Your \$1500 is worth more than another man's \$1500, if at all, only because you are able to buy more with yours than he can buy with his.

We believe that when you buy a Chalmers "30" your \$1500 becomes worth more than \$1500 invested in any other car. Careful investigation will convince you of this fact.

Please remember you are not buying a price or an adversistement: you are buying a car. Therefore examine the car on its merits.

If you investigate thoroughly a Chalmers will be your first choice, if you are able to get a delivery in your territory.

It is difficult to get more in a car, at any price, than you can get in a Chalmers "Forty" at \$2750. The "Forty" has all the power one can want, the quality to endure, beauty of line and luxurious finish. Seats for seven if desired. Catalogue "R" on request.



## Chalmers Motor Company

Detroit, Mich., U. S. A.



Chalmers "30" Touring Car and Roadster, \$1500
Pony Tonneau, \$1600 Inside Drive Coupe, \$2100 Limousine, \$2750

### OUR SEACOAST DEFENSES.

(Continued from page 301) put out of action, there are emergones put out of action, there are emergoncy rank finders installed on the flank of cach battery. This range finder is the Batr and Stroud 9-foot, self-contained horizontal base type in case these are put out of action ranges must be doter mind by means of buoys or from observation of the

The firing of morters is far more difficult than that of guns. The detach ments at the mortars are completely con ecaled These weapons attack the deck of ships, and when fired their location cannot be discovered. They are set for elevation in practically the same manner as guns, but their direction, instead of being set on sights, is accomplished by laying the mortar on an azimuth circle In other words the moriar is set for as In other words the mortar is set for an idvation corresponding to the range, and at an angle of direction equal to the azimuth of a predicted position of the target orrested for wind drift, travid to. Many authorities considered mortars in past years to be so in accurate as not to authorize their consentation. struction but within recent years the results of tests and the records of tar get practice have shown that mortars are of immenso value to seacoust forti fictions Several companies in our coast artillery have made as high as 80 per cent hits at ranges of six and seven thousand yards when firing on a mov-ing target having a speed of seven or eight miles an hour and when firing but cight miles an hour and when firing but one mortar at a time Mortars have particularly great value in repelling a reconnoiseance in force as they can be fired with impunity without disclosing their location

Another important arm, if not most important arm of defense in the at artillery, is that of submarine test These weapons are designed to mines repel an attack when the hostile fleet attempts to come in during a fog or when the guns have been put out of action The system is so designed as to render mines harmless to friendly ships the mine commander as to permit their being fired either by contact or judg ment. The electrical principles involved ment in the control and firing of submarine mines is kept a secret. Ten years ago it took almost two weeks to plant a group of mines. To-day, by the use of mine planters, a harbor can be com blocked within twenty four hours The work that will devolve upon cons

artilicry troops in time of war will be of the most trying and patience-racking

is presumed in making this state ment that no fleet commander would attempt an open attack or "run by' in broad daylight but would await the carly dawn in a partial fog, when search-lights are useless and the spirit of the men at the guns at its lowest obb its would, without doubt, wear the gunners and cannoneers out and try their pati and cummusers out and try timer pair ence by making many sorties and feints during late hours of the night and osr-ly morning before making his final at-He would also if possible await his attack until cold weather set in and snow had fallen, knowing how dispir-iting ice and snow are to soldiers living in tents, as they would have to do during WAT

In the harbor of New York, for example, if war were declared all coast ar tillery would have to live in tents immediately in rear of the guns.

Would it not tend to breed discontent and dissatisfaction among soldiery if they were required to answer "call to arms" every hour during the night for about two weeks in bitter

This is the work the count artillery This is the work the count artillery will have to do when it is called to de-fend our country's ports from the inva-sion of a foreign navy It will be then that the 'brave the

(Concluded on page 307)

## Wood-working



Engine and Foot Lathes

MACHINE SHOP OUTSITS, TOOLS AND SUPPLIES. SEST MATERIALS BEST WORKMANDHY CATALOGUE FREE FEBASTIAN LATHE CD 120 Culvert St. Clocked LANGLEYS AEBODROME -FULLY generated and illustrated in Scientific Full August A

Veeder Counters

to register receprocating movements or revolu-tions, Cut full size, Booklet Free Bookiet Free
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and Flate Charlings.
(Baymander I, Bronder)
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EARN BIG SALARIES

### Money Could Not Make its Power Plant More Perfect

99728



upmobile indiagram just as fine, and careful, and conservative "It incorporates the same high grade

The Happunolule dealer who also sell asome other our of the highest reputation and price, can, with perfect consistency, lift he hooks of both and say to you.

Of the power plant in the larger, contlier car, he can say with perfect truth "This car, he can say with perfect truth "This lift has the can say of the Happen of t

by the other
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ial) as the leider's among cars of the arge-class.

The man who owns the two types—the The most the leavier, costiler car-per of the carpet of the carpet of the ill morries of the carpet of the carpet Do you wonder that the Hupmobile de-mand is so widespread and insistent that the facilities of the great new Hupmobile that the carpet of the carpet of the carpet Have a target on the carpet of the carpet rite for the illerature Leaving Detroit December 7, 1004-just after the of the winter- three Hupmobles negotiated the tity hy fan 6. Over every mile it was a battle trip-with every on it and ready to turn back completion of the severest task ever imposed on a Christman blissard and the heaviest snowfall countd miles between Detroit and New York: with the snow, and the termination of the at once for Detroit -nurrised the successful our of Hupmobile size and type

HUPP MOTOR CAR COMPANY

OMPANY Dept. Q LICENSED UNDER SELDEN PATENT DETROIT, MICHIGAN

of material
"It will render within reason precisely

"It will ender within reason precisely the same quality of service in the proportion of power produced, the quick and matter of speed, in featbility, is smoothness, and in all around efficiency on the study it saves on the grade" the study of the study is save to the grade the product of th

### HALLEY AND HIS COMET

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MUNN & CO., Inc., 361 Broadway, New York City

Legal Notices

### **PATENTS**

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A Free Opinion as to the pro-lity of an invention will be read!

MUNN & CO., 361 Breadway, New York Breach Office, 625 F St., Washington, D. C.

### INDEX OF INVENTIONS

For which Letters Petent of the

United States were issued

for the Week Ending March 29, 1910,

AND BACK BRADING THAT DATE

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(Concludes from page 506.) setive, and the vigilant" will be called upon to show their true colors and "make 5004."

OUR CIVIL DAY.

(Constance from page 302.)

particular day stays on the world (the entire world) for an exact hour

Let us trace the front end of the twen-

Let us trace the front end of the trensitation country by this system of progress. We again above it as having reached its eighteenth hour on earth as it not former illustration. That is to say, it has reached the 80th meridam were of Greenwich, or central time, but as entired have sent the head end of our centur? to 87th deg, west, making it arrive there have sent the head end of our centur? to 87th deg, west, making it arrive there has a hour too soon. We then compel its or tary there until it is a half hour list. Then it takes another jump to mountain time, which lands the let of January. 1800, at the 112th deg. W meridian, and so on. By adhering strictly to the system; tu un or's what happoner to the system of time, which it is the system of time, which is not the system of time, which

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when they should be in "iconorrow".

I once referred to these zone lines to a friend as imaginary "imaginary" and he, "I will never forget the time I passed over one when going to California Two will be the state of the state

have left the trucks. That is the point where the western time some overlaps to such an extent that it actually meets an enterty defection from the Penille sons. The porter would have then called, "Sate The porter who have not looked loosely into this complicated subject, the first question that connect to their lips in. Way hat home the sate line and some lines stright in practice as well as in theory? Suppose that you live on Main Street.

E-M-F

There must be a mighty solid basis for the phenomenal success that has followed the E-M-F Company from the very first.

No other Automobile Concern ever has enjoyed the tremendous success this one has.

The whole world knows and all the world is talking about the Company and its cars, constantly. There must be a reason and it must be a good one. Even competitors admit that!

Everywhere, E-M-F "30" is first choice of that class of buyers who want all that can be had of efficiency, power, durability and elegance and comfort at a price under \$2,000. (E-M-F "30" sells for \$1,250 fully equipped with five lamps, generator, horn and magneto.)

The farther you seek for the reason for this greater popularity—for the splendid reputation achieved by this car in so short a time, the more does it appear that after all, the car itself is the real reason.

Ten thousand people are daily engaged in selling E-M-F "30" cars—largest sales force and the cheapest—for they all work for love.

They are satisfied owners.



The E-M-F Co., Manufacturer Detroit, Mich.

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to Bee compressed air agrice 963,265 953 070 Pas combination deak and wall Meeten & Finch Pastellay device M O'Denovan Pastellay device M O'Denovan (Continued on page 200)

(Cancluded on page 305)



### Try Kerosene Engine 30 Days Free

Gasoline Prices Rising.











(Conclusive from page gay)
deg west of Greenviels passes right
through your froat parlor. Yes will
through your froat parlor. Yes will
therefore set your hall focks an hour freward and let your little manial clock
stay as it is now Very soon you would
like to defect the line enough to at least
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was put there, not only to keep the line
was put there, not only to keep the line
out of your peighbors were unaware of this defection east of Maine is
a proof that the line benders were unaware of this defection east of Maine is
a proof that the line benders did thater (Concluded from page 507) a proof that the line benders did their work well If a very large percentage of the people of the United States knew that their sone lines were bent, it would be time to bend them into some different form

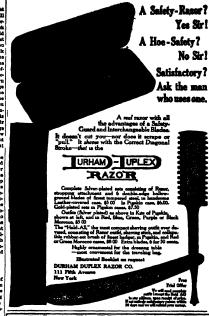
form
As some readers might overlook the
fact that the astronomical day begins and
ends at Greenwich at noon, 12 hours later
than the beginning and ending of the civil or common day (the day we sleep and eat and work by), we should make it plain that all the illustrations and remarks apply to the civil one The astronomical day is a clean cut straight lin affair that needs no adjusting to prac-tice. The users of this kind of a day do not try to thrust its date line aside. The observatory at Greenwich was built right on this line and to make it more realistic a bronse tablet is set in stone with prime meridian (Zero Degree) en-graved on it so that it may be seen and felt by those who visit the observatory

The Energy of a Coiled Spring

The old question of what becomes of the energy of a coiled spring placed in sulphuric acid cropped up again before the Western Society of Engineers during a discussion on the conservation of en ergy Dr Steinmetz gave this explana-

The heat produced by the chemical The heat produced by the chemical sation in a coffed spring when dissolved, is greater by the amount of energy stored in it than if the spring were not under pressure. The amount of energy which is stored in compressing the spring in best measure is so instinuition to the contract of t done a greater best in dissolving than the uncompressed spring, in an indirect manner. The measure of the chemical conery is the electrical potential differ-ence. If one dissolves iron in an said and the iron is under strain partly com pressed, partly not one finds an unequal corresion due to local current between the different parts of the iron. If there is a local current it means that the diltial differences against the slectriyths that is different chemical silinities, and the part under strain is dissolved first, showing a greater potential difference and thus a greater best produced in its solution. Thus, if only a part of the spring were compressed, the other part on, the compressed part would dissolve first in the substurie acid by the local current dreating between the two, showing that it is solution given more desired than it administration given more array than that of the absolute given more present and the state of the absolute present part of the state of the absolute present part and that of the absolute present part and the present that the present the tial differences against the electrolyte

Thomas Bitimo resently took out a patent on an improvement in his storage battery According to the patent the active material for silenine storage batteries in impressed with an oxygen commass in a solution of a binnuth sull, then subjecting the material to centricular the control of the co



CASTELL **\*** 1 DRAWING, COPYING AND INK A.W. FABER erson Street, Newark, New Jarney



He Gets GOOF Because BE IS A SERLED WATERMAREN
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Emco Automobile Oils and Greases

have all the requirements essential to perfect labrication of a saturabilit. For both quotien and steam cars. ESCOLIN a substitute for quotien and just as efficient at less cost. Sal nation on permanal quantum. Write for proce and enaph-High Fire Test. Low Cald Test. Great Viscoulty. He Carties rication of an

EMERY MANUFACTURING CO. Refiners of Pennsylvania Cru



The name Warner has for years stood for absolutery in practically every line where the determination and is a factor.

The Warner Horograph, an electrically-operated race of device, regeters bundredths of a second. It is so far-rior to any other that it was adopted at once by the onal Racing Amocasion.

near to any other that it was adopted at once by the onal Recing Association. And the Warner Auto-Meter bears among motorists youth title of "The Aristociat of Speed Indicators." In fact, the sole slogan of competition may be said to be, "It's chi-shifest."

LET US SEE WHAT MERIT THERE IS IN THIS CRY OF CHEAPNESS:

No expense whatever is geared in its construction. Accuracy and dependability are note aims. It is built with the same care and theoroghous as the finest watch. Yet the demand for the Warner Auto-Mater has norround or rapidly that our et has been quadruphed within two years. And our factory is the best equipped of and in the world.

How, then, can sayone dae make the same quality more cheaply than we? Must there not be a reduction in accuracy, in reliability, in quality, to offset closur spore? Judge for youself. And remember, that the Warner Auto-Meter is constructed on the only pract th experience had demonstrated to make accuracy under all conditions—many

We issue a very matructive booklet on speed indicators h we should like to place in your hands. Wate for it, or call at our nearest branch

Warner Instrument Co. ... willie W. H. H. W. AANCHES Adam 115 Edward Arms Bonn 225 Brief Stort 1 Briefs 727 Heis Stort 1 Br







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## The Overland **The King of Cars**

It requires four factories, employing 4,000 mm—taroing out 140 Overlands duly—to meet the flood-like demand for these cars. Yet two years ago a hundred virsals had a larger stage. The reason lies largely in the car's utter amplicity. Its able deagner made it almost trouble-proof the created an engine which, for endamnoc, is the marvel of engineer-line.

He designed the pedal control One oes forward or backward, slow or ist, by merely pushing pedals The ands have nothing to do but steer

or trouble.

The Overland always keeps going, and almost cares for itself. All the unual complexities have been climinated.

nated.
That is why each car sells others, and our orders for this year's Overlands amount to \$2.5,000,000.
Another fact is that no other car gives nearly so much for the moment of the contract of the contract and the fortunes leveled in our automatic machinery. It would bankrupt a small maker to try to compete with us.

pete with us.
You can get a 25-horse-power Over-land, with a 102-inch wheel base, for \$1,000 You can get a 60-horse-power Overland, with a 112-inch wheel base, for \$1,250 The press include lamps and magneto.
This car, which has captured the country, is the car you will want when you know it.

### Two Free Books

Nothing is published about automobiles so interesting as the facts about Overlands. They are told in two books which we want to send you. Every motor car lover should have them Cut out this coupon as a reminder to write for the books today.

### The Willys-Overland Co.

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something for certain classes of articles numbered in WITTE & CO. Inc

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fact that the correlot had been tampered with For parfections of them. Not Research. lagging to \$6011 - For manufacturers of ma-rishers applies see to equip a small plant for the manufacture of iridum-tipped gold nib making for

### WANTED

A THOROGOMEY LPTO-DATE FORBMAN for a bustling and apoble repair shop. None but a solar competent man reed apoly. Also ten marchimistabilised to automobile resulting. Young & Co. Newharph 19. Inquiry No. 2015. Wanted queblinery necessary for an installation of a plant for century said by a

### HEI D WANTED.

MECHANICS AND INSTRUMENT MARRIS, first class unit, wanted at once . State references and wages desired V W. \$5-155 Broadway New York Impairy No. 9841 Wanted to buy silk transitions from to reside a winting, doubling, to the Stati process of making it jobs and her

### SITUATIONS WANTED. COPPERMITH expert, understands the business thoroughly Abis to work different kinds of metal expelled of taking charge of shops desired in make a cleaner. Address Musi Worker Stox Fig. N.

Impulsy No. 98-29 Wanted catalogues and all information on pacelinery for braiding street incana hackling atom pace.

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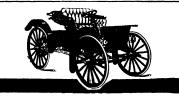
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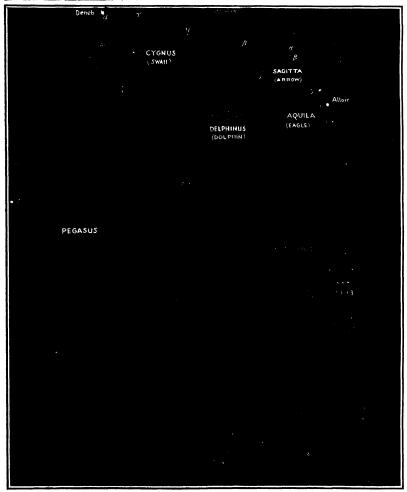






### A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CHL. NEW YORK, APRIL 16, 1910.



### SCIENTIFIC AMERICAN

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NEW YORK SAFERDAY APRIL 16th 1910

The help is a town-good to receive for examination illustrated articles an subjects of time is interest. If the photographs are sharp, the articles about and the losts continuous the continuous will receive special artention. Accepted articles will be paid for at regular space rates

THE WORLD'S FAIR OF THE FUTURE \ all probability the city of San Francisco will hold an international exposition, or as it is hold an international exposition, or as it is more popularly known a World's Fair to elebrate the opening of the Panama Canal in 1915. If the promoters of the fair are willing to profit by the lessons of former expositions their efforts will be directed to making the coming fair notable not bulk and area but for its compactness and the genuine excellence of its carefully selected exhib the grauine excellence of its carefully selected exhibits. The trouble with many previous expesitions has been that they were big to the point of being wearl some and oppussive. A climax in this direction was resched at the St. Louis Fair. In one single building of which a visitor had to traverse nine miles of ables if he wished merely to walk past the whole of the exhibits. Whatever may be the ulterior motive, the avowed object of these exhibitions is educational Therefore, they should contain only the most dis-tinctive and valuable results of the world's scientific industrial as injected and constructive work. And this connection we would ask whether it is not almost an insult to the good taste and intelligence amoust an insult to the good take and intringence of the millions that are solitate to enter such an exposition If a large section of its space is devoted to that cheap form of entertainment which was inaugurated by the notorious Midway Philanane at the Chiergo Exposition San Francisco will have a great opportunity by breaking away from certain false traditions to render this, the latest of the ex-positions comething better than a mere plaything of the malestate dealer the side show man, and the poll

### GYROSCOPIC EFFECT OF REVOLVING AEROPLANE MOTORS,

SITTRE were certain conditions in the rece fatul secident to Le Blon which suggest that the gyroscopic effect of the motor may have contributed to the disaster. He was using a light monopina of the Herbot type driven by a Gnome revolving motor. The aeroplane, although any aparently instat and in good working order be ansumanageable and truring completely over, fell to the ground Now, the gyroscopic effect of the 187 pound motor running at 1,200 revolutions per min ur, must have been considerable A sudders turning of the aeroplane to the right or left by the aviator would produce a strong upward or downward gyro scopic tipping (endency in the longitudinal direction if this undency were aggravated by a gust of wind it is conclivable that the aciator would be unable it is concelvable that the acistor would be unnow to control the situation sufficiently to prevent a com-plete upset. At the time of his fall Le Blon was fly lurg above the bay at San Schastian Spain, in a bigh gusty wind is it not possible that the joint action of the wind and the gyroscopic effect of the engine and propeller was responsible for the disaster? The and properties was responsible for the disaster? Interactic death of la lagrange when he was using a monoplane equipped with the same type of motor suggests that his sudden upset may have been due, in some measure to similar causes.

OUR PRODUCT IN OUR OWN AND THE BRITISH HAVY E are frequently asked by correspondents to give some comparative figures show ing the relative excellence of the shoot ing in our own and other navies. We would gladly do so, but it is a fact that there is no information regarding the navies of the world more difficult to obtain than this France and Germany, in particular never giving to the world the results of target practice Both the United States and Great Britain however, do publish such figures. But even here it is often difficult to establish accurate comps sons, because the data which is made public is a dom complete, either the range or the size of the target being frequently omitted, and no statement target being frequently omitted, and no statement being made as to whether target or ship or both were moving However, we offer the following compari-son, which is based upon official figures. The Engineer of London states that the results for

the past year have shown that each 12 inch and 10inch gun has averaged 063 hit, each 92-inch gun, 194 hits, and each 75 inch gun 247 hits, these b the average number of hits per gun per minute for the whole navy The 6 inch 47 inch, and 4 inch guns varied from slightly over 4 hits per minute for the

6 inch to 9 hits per minute for the 4 inch By the courtesy of Rear Admiral Mason, Chief of the Bureau of Ordnance we are enabled to publish the average results obtained on all the guns on all the ships taking part in target practice in the United States navy. Whether the ranges and the size of the targets corresponded to those in the British navy, we inspets corresponded to those in the British may, we are unable to say The results are, for the 12 luch guiss 0.72 lift per guin per minute, for the 10-inch, 0.75, for the 8-inch, 183 and for the 7 inch, 313 lifts per guin per minute, while the results obtained with the 6 inch, 5-inch, 4-inch, and 3 inch were practically the same as were obtained in the British navy One 7same as were obtained in the British havy One r-inch gun holds the remarkable record of 1028 hits per minute, while the highest acore with the 12 Inch gun firing when the ship was under way in smooth water, was i hits per gun per minute obtained on the United States ship "Obto"

### CERTAIN ADVANTAGES OF LIQUID FUEL

¬O judge from a succession of articles which have been appearing in one of the newer and certainly the most noisy of the London and certaint the bloss noisy of liquid fuel in the British navy, one would suppose that the virtues of this fuel had only revently been discovered and the the Admiralty had determined to abolish its coal depots and turn the bunker rooms of its warships into eil tanks. As a matter of fact any such sweeping subatitution of oil fuel for coal is not now contemplated nor ever will be either in the British or any other The natural sources of oil supply are not suffi DOVE cient in capacity nor are they so widely distributed, as to make it possible either for the merchant marine as to make it possible either for the merchant marine or the navies of the world to make a wholevale sub-stitution of oil for coal. Some countries notably the Inited States and Russia possess such abundant sup-plies that they could, if they so wished, make a much more complete use of oil, and, because of this advan-tage it is not unlikely that our navy at least will ultimately make a more extensive use of oil fuel than

The navy of any other power

The advantages of oil over (oal are so many that were there as much oil in sight as coal the new fue would in vitably supersede the old altogether. In the first place, the higher evaporative value of liquid fuel not only enables a larger quantity of fuel to be carried in the same space but its use renders possible a decrease of 75 per cent in the number of stokers or fire toom attendants. Being in the liquid form it or are toom accondance. Being in the inquig form it can be employed as ballast and pumped into remote quarters of the skip far removed from the boller room and inaccossible for the handling and transportation of coal. For the merchant ship this means not only a saying in the fuel and labor bill, but a positive gain in cargo capacity, while for the warship there is a similar reduction of expense and what is of far greater value, a considerable extension of the crule-ing radius or the distance over which the ship can travel without replenishing her fuel supply. For the merchant ship there is the further advantage that the bunkers can be filled by a pipe line without the delay, dirt and disorder which accompany the present coaling operations, while for the warship there is the strategic advantage that the ship can take on fuel b; a pipe line from a tank ship at any place and in any but heavy weather Furthermore, the use of oil enables a whole fleet to steam without emitting those tell tale clouds of smoke which are one of the surest means of betraying its presence to the enemy

### ARCIENT AND MODERN TRRIGATION

STRONG contimental interest will be aroused by the announcement that the great in tion works which at the very dawn of history rendered the land of Mesor garden of fertility, are now being repeated on an activative scale under the same engineer who was responsible for the very successful irrigation works in the valley of the NIIO our United States Consolinate States Consolinate States Consolinate States Consolinate Consolinate States Consolinate Consolinate States Consolinate Consolinate States Consolinate States Consolinate Consolinate States Consolinate Consolinate States Consolinate Consolina garden of fertility, are now being repeated on an

value, according to the Turkish government, will be \$155 per acre, the soil being capable of yielding large crops of wheat, barley, and cotton. We spoke of sentiment entering into the interest

We spoke of septiment entering into the interest with which we regard this work, and there is containly something that appeals strongly to the imagi-nation in the fact that both in ancient Egypt and in nation in the fact that both in success Egypt and in were more ancient Mesopotamia, the Anglo-Eaxon, after a lapse of four or five thousand years, should be repeating on a larger seals and with the greater akill rendered possible by modern appliances those feat irrigation which are one of the chief girsts of the ancient, but never-to-be-forgotton, racon that once fourshold in the valleys of the Nile and the Eughanus. Whatever may be the future rate of the great As-

gio-Saxon race, the vast works of irrigation which it has carried out in India and in Egypt and is now seeively prosecuting in Mesopotamia, must ever stand out as one of the brightest evidences of its civilizing and uplifting activity

During the recent progress of President Roos-veit down the valley of the Nile, his visit to the great reservoir at Assouan and the sight of the marvelous reservoir at Assouan and the signt of the marvesions fertility with which it has enriched the valley below, must have carried his thought to those swen greater works of trigation which are now being prosecuted in the arid region of our Western States; prosecuted in the arid region of our Western Stakes, works which owe their inequious largely to his own tireless energy and enhulsams. Horse also the laised and most powerful branch of the great Anglo-Baxon raw, in the space of a few years, has completed the initial work for a project which promises to bring thirty million acree of unproductive and under the richest cultivation. And in the connection it is timely to draw attention to the great ability with which the Reclamation Service has done and is now carrying on its work A well-deserved tribute to the engineers in charge was recently made by Senator Yowland of Novada in which he stated that the proects had been for the most part wisely selected crit had been for the most part wheely selected and the work well done, such milatelee, mose of them serious, as have been made being the result of the serious, as have been made being the result of the extraordinary pressure brought to bear upon the Re-imanton Service by the political representatives of all the control of the political representatives of services organized that has ever existed in the hier country. The Committee on Irrigation of the Squate has been emanged during the past year in visiting these various works, and not a whisper of corruption has reached them. It has been a work conducted with are intelligence, with near laterity, and with rare speed,

The work already accomplished consists in the provision of dams headworks, etc. and the \$30,000.000 now required is for the purpose of utilizing the water so stored, by the construction of canals for dis-tributing the supply upon the millions of acres which only await its arrival to spring into instant fertility.

### TESTS OF TURGSTEN LAMPS

a bulletin recently jasued by the University of illinois T. H. Amrin, and A. Guell present the results of an important study of various types of tungsten and incandescent lamps a study which should prove of considerable interest in view of the growing importance of metallic flament illumination The conclusions of their investigation may be thus

Comparisons of the durability of filements made by the colloid, deposition, and paste processes are very difficult to make because the three types are usually mounted differently Undoubtedly the manner of mounting the filament has a great effect upon its life, and whether the superior life of one type lamp is du to the fact that it has a better scheme of mounting or to the fact that the process of manufacturing is bet-ter, can hardly be decided definitely from these tests. ter, can hardly be decided definitely from these tests. Tests of filaments made by the three processes and mounted in exactly the same way would be necessary to decide the question definitely From the tests de-scribed, however, the colleds process seems to give a filament that is less durable than the other two. The diament that is less durable than the other two. The tests show that performances of ungains lamps vary to a surprising degree, depending upon the kind of lamps used and upon the conditions under which they are burned Some lamps will give as high an operat-ing cest as the old carbon lamps withis burning under certain conditions, whereas other jumps will give good results under those same conditions. Under the best conditions, however, the tungsten lamps now on the market give excellent results. "Hest efficiency is ed in a remarkable way and the life is very long, often several times what the advertised life is Breakages in shipment and handling have been re-duced to a small fraction of what was formerly comduced to a small fraction of what was formerly com-mon of, three hundred lamps purchased for the tests by the experimenters, only three were received with broken filaments; and although the lamps in some of the tests were handled doesne of these, almost no trouble was experienced so far as the breakage of fila-meats was concerned.

### Scientific American

### ENGINEERING.

the Minister of Public Works of Panama will incitly ask for bids for the construction of a railroad from Panama to David, a distance of 300 miles. Bids will be saked also for lines from David to Booss del Tore, and from Panama to Los Santos.

The Nevy Department recommends an appropriation of \$10,000 for prizes, etc., to be awarded ships in commission for general efficiency and economy in coal consumption. It is estimated by the Department that ampetitions of this character have resulted, and will continue to result, in a saving of ten per cent in coal consumption.

In spite of the steady increase in passenger travit in this city, the opening of the new East River bridges is beginning to tell heavily upon the traffic over the East River ferries. The Union Ferry Company of Brooklyn has been obliged to discharge three boat crews, and change the schedule on three different lines from a 10-minute to a 30-minute headway.

Acting on the recommendation of the Public Service Commission, the Interborously Company of the vice Commission, the Interborously Company of the civity will install care with destination aigns on the which will automatically tell the elevated lines, which will automatically tell the elevated lines, which will suppressly the station the train is approaching. The great of the station the train is approaching. The great convanience of this arrangements to the travel public will be out of all proportion to the small cost of putting it in place.

The British Navy estimates for the present year call for five battleblap of the dwasdought type, five protected cruisers of 25 knots or over, twestly destroyers, a number of submarines, and two floating dots in cluding the shipt to be laid down this year, the dreadnoughts built or building for the three leading suppowers are for Great Britain, 27, Germany, 17, United States, 19.

Speaking on the subject of defective open-hearty ralls at the last annual convention of the American Society for Tweing Materials Robert Job emphasizes the fact that the more term 'open hearth is in latest the open subject of the speaking of the speaking open will give good service, since they are subject to the same general defects of manufacture as Desemenralls, and hence require equal care during rolling of

The Pennsylvania Railroad revently ran its first Pullman train from Herrison, N J, by way of its new tunnel system to Long island and return It will be three or four months, however, before the whole system is throat open for public service. The tannels to Long island, unless the plans of the company minearry will be publicly opened on the 18th of May, and those to the westward under the Hudson River by about the 18th of July

The Army Board is making some important experiments to determine the resisting power of a solid mass of concrete, as compared with armor plate in a recent test with a Eleche gun, a shot was fived which ponetrated the concrete for a distance of 21 Feet, which is equivalent to the pilerting of a Elench armor plate in a second of the contract of the c

The Director of the Royal Dockyard at Castellamars, tally, has produced, if the reports are to be believed, a torpido boat without funnels By means of eletrical ventilations the products of combustion are discharged from the vessel without the assistance of charged from the vessel without the assistance of Castellamars to Naples, are said to have been set trumbly successful, no smoke being shown and the vessel gutting up steam with great rapidity

reassing setting up seems with great rapisities. The shortespec or surplusage of freight care is one of the reliable Indications of business getting, if not of basiness properly? The great surplus of care which existed at the time of the panie in November 1907, was gradually reduced until it was wiped until the substance of the substance of the panie in the substance of the panie in the panie of the panie

The Medece and Manhatan Rallroad Company he built two stell cars which are specially designed for transporting begage between the steam rallway term inch, which are served by the Fotions River transits, with a view to avoiding eiths making and trucking, each car is arranged to receive eight loaded baseque, each car is arranged to receive eight loaded baseque are to be a reason of the care of the care of the care.

The inthusine Court Commission has called for the manufacture, delivery, and execution or ideas it for the manufacture, delivery, and execution or ideas in the constraint of the forty-size rathering look gases of the look passes of the look passes of the look passes are built. They are all about 45 feet wide, and 7957 from 47 feet 4 inches to 25 feet in beight. Find one shows the other look of the look passes of the look passes of the look passes are built. The contract will be worth deposit passes, and the look passes are looked to the look passes and look passes are looked to the look passes are looked to the looked to t

### ELECTRICITY

At Exercit University a wireless telegraph club has been formed with a view to studying wireless telegraphy, and one of the special objects is to discover some method of overcoming amateur inter-

Some time ago the United States Steel Corporation installed two Heroult furnaces, one at Worsteen Hass, and the other at South Chicago These for mace have been in constant service ever since, doing twelve bests per day it requires between an hour and an hour and a half to reflue a martie ton of steel and 100 kilowath hours are consumed to describe the control of t

A test of the telephone service in Wikonaia was recently made by a cannination. The investigation was carried on servely, so as to determine the actual conditions of service it was found that the average time between a call and a response was 478 seconds and the allowest are 78 seconds and the allowest in 78 seconds and the allowest in 78 seconds and the allowest in 78 seconds and the storest in 78 seconds and the storest

It is remarkable that while witches belgraphy has made rapid strides very important considerations have been atmost entirely neglected. Much attention have been atmost entirely neglected. Much attention has been pattle to attenment and selectivity and also to the removement of the automates while the development of the automa has been slow. At the, reviewing attains particularly not much has been done toward containing the automa has been standard to a standard to the automate of the standard of the standard has been attentions and also made to the standard has been extensively adopted in practice.

A telephone cable board with Papin colls was laid in Lake Constance in 1906. This was a lead-covered cable and it was very difficult to lay it on account of its great weight. Mr Diesel-hors, who laid the cable has been experimenting with leaded submarine the photos cables and has evolved a construction with his photos cables and has evolved a construction with his don with Paris. The cable is covered with guith don with Paris. The cable is covered with guith specha and wire absenting and the loading cells have been introduced so ingeniously as to increase the disaster of the cable from one into he but three ins less for greatesty in the cable swelled at the leading points that it can be paid out over a forf out sheaves wheel months, and from time to time has been subjected to pressure of four ions per square lark.

A section of tests has recently been made to derive mine the strength of the metallic finaments of lamps and their resistances to shock. The lamps were tested by placing them at the bottom of an inclined purpose, and rolling rubber bails filled with lead down the plane. The shock was varied by starting the lails at different distances from the lamps it was found that with lamps of equal rollary the strength to the filament varied invreely as the candle-power and for lamps of equal candle-power the strength varied inversely as the voltage in some lamps it was found that certain parts were more sensitive to shock than the filaments. When the filaments were heated to a white heat they became too finalitie to be broken by a shock, but the loops were distorted under repeated blows until they came to contact with each other

Sterilization of white wine is the object of a paper presented to the Academic des Sciences by Meser. Maurala and Warcollier Previously they studied the action of ultra-violet rays from a quarts mercury raper lamp upon edier in fernantation. With the white wine and found how much time it took for the rays to act upon different thicknesses of layer so as destroy the fernanting principle and thus prevent any now fernmentation. Using layers of vise of \$\frac{1}{2}\$ until the prevent any now fernmentation. Using layers of vise of \$\frac{1}{2}\$ until the prevent any now fernmentation. Using layers of vise of \$\frac{1}{2}\$ until the prevent any now fernmentation. Using layers of the lamp so that the part of the lamp and a place plate and exposed to the lamp so pours below 5 seconds. With 17 millimeters (0.07 linch) exposed at the same distance from the lamp course below 5 seconds. With 17 millimeters (0.07 linch) exposed at the same distance from the lamp formatication was always stopout after an exposure of over 1 minutes and never 10 less than 30 seconds. It is striked to the lamp of the lamp and the lamp of the lamp of

### SCIENCE.

Prof. Biliprocht's tablet, said to uphold the Biblical account of the Duluys, was discussed at a meeting of the American Oriental Society at the Johns Hopkins University, Teof. G. A. Barton of Biryn Mawr College, Prof. Paul Haupt of Johns Hopkins University, and Prof. Albert T. Clay or Yale University, thought that Prof. Hiliprocht had been too imaginative in interpreting the transmentary inscription. It is asserted that the restoration made by Prof. Hiliprocht and in broken lines were conjectural emondations. Prof. Hiliprochts claim that the tablet was written some the professional states of the professiona

The perhases of dero of varilla are due to a unitarious called vanilla, which also occurs as a larved eat of auntrous resins. Vanillin has been made arrected a unitarious resins. Vanillin has been made arrected to the control of th

The price of pure Para India rubbr, which in 1802 was 88 cents per pound, rose hat year to \$2.25 per pound. This increase in price gives additional interest to the processes of regeneration of waste rubber and of the manufacture of substitutes. The regeneration of vulcainsel findia rubber consists in removing the sulphur, which was added in the process of vulcainse. The warm rubber is made in the process of vulcainsel into The warm rubber is used on the process of vulcainsel, the process of vulcainsel, the process of vulcainsel, the process of vulcainsel, the process of vulcainsel to the process of vulcainsel, and the process of vulcainsel in the subbur of vulcainsel in the process of vulcainsel in the subbur of vulcainsel in the process of vulcainsel in the subbur or subbur applied by resulting financed of livel supplier or subplier.

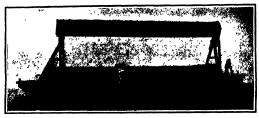
One of the most interesting results of the Smith sonian African Expedition has just been published by Mr Gerrit 5 Miller Jr (urator of the Division of Mammals U 8 National Museum under the title of Description of a New Species of Hippopotam There have been for some years in the collections of the National Museum two skulls of hippopotami, one of which was from the Zambesi River East Africa and the other from Angola West Africa. These skull differed materially in several details of form chiefly 7 hese skulb however in the constricted shape of the rostrum, but the characters were not deemed of sufficient va justify the creation of a new species for the differ ences might have been due to individual variations The receipt of eight skulls from British East Africa collected by the Smithsonian African Expedition showed conclusively that the individual variations were so elight in the East African specimens that Mr Miller was led to believe that the two skulls repre sented two distinct species one from East Africa and one from West Africa A critical study of the sk revealed other differences in their characters that were of sufficient importance to justify Mr Miller is making a new species of the West African specimen to which he gives the name constrictus

The gas bega of modern balloons are made of a cot on fabric control with India rubber in the most careful manner, in order to source perfect impermebility without surficing likshress For all large balloons, and especially for dirigibles two layers of cicht are superposed and comented tog their The outer skin is revered with India rubber on one side only but the inner skin is coated on both sides in derman balloons the inner cauvas is cut straight and the outer saves is cut bein as in the caustra in the cauvas is cut straight and the outer cauvas is cut than in this caustrate one series when the cause is sufficient to the cause of the

### THE "VIRING" SELF-DUMPING DECK SOOW.

BY THE REALIST COMMENDEMENT OF THE RESERVE ABEREAN
A novel system of self-clumping seven sepsicilly designed for the discharge of rock and solid dibris has
been devised by Mr. A. F. Villing enginer and shipbuilder of Sick known. At this port the economical
dumping of such material into the water is of part
tudus interest inanumb as the blasting of rock in

equilibrium of the latter is spect usersly by foreign start through the searcy of compressed art include start through the searcy of compressed art included should be lost. Should the frush deck be fitted with low bulkarks, these are fashloned in the forms of bot time hispad doors on the discharing side, so that they fall down as the burne besis over, and permit the load to be sinct cleanly.



After dumping, the seew returns to an even keel.

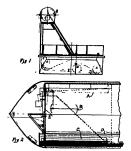
connection with the extensions to the harbor or the sixtees of the (ity is in continuous progress. Several designs for automatic damping have been evolved the the Viking's system so called after its designed, has been the first to be submitted to practical test and has provide remarkably successful. Through the courtesy of the inventor we are enabled to illustrate and deerthe this new targe. It differs in its action from any In the hold of the scow on the side opposite the elevated cylindrical tank is carried another tubular tank A about haif the length of the former. This is filled with water, and in the case of the scow libed with values of the cover holds about sat tons for a load of 200 tons on the dreck. Alongside this water tank is a small cylindrical vessel? Be containing compressed air the pressure being approximately seven atmospheres. On the same side as the elevated tank in the hold below, is a third cylinder C sha shout haif the length of the clevated

compressed-sir ressel is also consected to this waive box, but is shirt of from the same until ready for dumping. The thirty ressel below the elevated quinter, a siready monitoned, is always open to the free stmesphere through a pipe, but there is a second pipe said valve provided in consection with the mail communivated cylinder. It will thus be seen that there is always open communication between the first water tank and the elevated cylinder by means of a main ple which is carried up alongside the vertical lag of the tripod at one end. In addition there is a smaller at pipe running up one of the triangular legs and passing right into the body of the tank, having it and position grate that the cylinder maide. This bigs is maily the upper vassel is full of air.

The load is stowed on deck in the manner shown in

The load is stowed on deck in the manner shown in the illustration. When rock is handled, bulwarks on three sides only are necessary, the fourth side from which dumping is effected, below the elevated tank, being jett quite open or at the most having only a lowering. It soft material is carried, hinged doors, as already described, may be used, these automatically opening under the pressure from the load on deck when the scow is inclined in the dumping operation, and falling flat and clear so as not to obstruct the shoot. When the loaded barge has been towed to the dumping site, a cord is pulled connecting the mechanicing site, as cord is pulled connecting the mechanicing

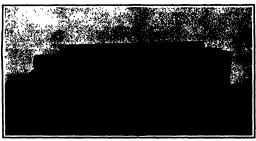
When the loaded barys has been towed to the dumping site, a cord is pulled connecting the mechanism of the scow with the tug 'This opens a valve, which permits the compressed air to flow to the valve box, and also a slide valve in the latter, whereby the cempressed air is admitted into the lower water vessel A. The pressure exceted forces the water from the lover task into the shevated cylinder, D. the displaced air was the control of the control of the control of the charge of the control of the control of the control of the related to the control of the control of the control cord is again pulled, the side valve in the control cord is again pulled, the slide valve in the



 $A, B, \ell^+D$  are ballest tanks by the emptying and filling of which the second is damped and righted

Find elevation and half-deek plan of scow.

other resuch of this chass in service Insamuch as in stead of the contents being dumped through self-open lag doors in the bottom of the hull the scow is tipped over on its beam ands by a very subject self-of the discarried on a fusik deck or the latter is fitted with too belawake no one stds, extending the full laught about 16 feet above the level of the elect on two rippeds. When it is desired to domy the barge, the trippeds. When it is desired to domy the barge, the



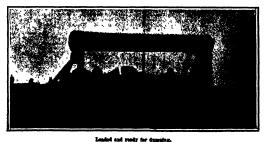
The scow tilted and load sliding into the water

cylinder which at first is empty, but which is always open to the outer atmosphere through a small pipe

The water vessel A in the body of the pointson is in open communication by means of a pipe E with the clevated tank, and the former is also in connection by another pipe with a valve box placed at the foot of the ripod carrying the upper tank. When the valve in this box is in its initial position, this second communicating pipe is open to the free atmosphere The

valve box is returned to its normal position, cutting off the supply of compressed air to the lower water tank, and at the same time opening the latter to the

free air. The load may slip off the deck at varying inclinations, this factor depending on the friction between the load and the deck and the character of the debrie If the slipping takes place early, at a low deck inclination, the upper cylinder may never reach the value for the scow rights itself immediately the load is discharged. Should such result, the water forced into the elevated tank returns to the lower water tank directly not compressed air supply to the latter is set of by the compressed air supply to the latter is est of by the may happen, however, that the new heals right over, and the upper tank is brought into the water read the upper tank is a brought into the water read to be latter in the control rope, which at once opens the communication between the upper tank D and the water reased O placed immediately below it in the hold. At this latter has it salways placed in a position lower than its always placed in a position lower than its elevated cylinder, the water must flow by pravitation to the control rope, which at the latter has it is always placed in a position lower than its elevated cylinder, the water must flow by pravitation to it. When a sufficient quantities of water has passed in the hold, by gravitation. This accomplished, as well as that in the hast immediately below, returns to the main water cylinder on the opposite side of the water translining in the some placed in the hold, by gravitation. This accomplished, a fourth pull on the control cord returns all parts to their original positions. The compressed air is to later original positions.



LEES . AINTHO .-- V RETURNISHING MARK BOOM.

Scientific American

the elevated tank, or the one immediately below it, must return to the first tank on the opposite side of the barge, as this laster is placed at the lowest point, the return being purely gravitational it will also been that the water circulating between the tanks cannot escape. Giverine is mixed with the water to revent freezing in cold weather, so that the system can be used any time of the year irrespective of cli-

matic conditions.

The soow shown in the accompanying illustrations is in daily service at Stockholm, and has proved emisently antifactory to the engineers of the city. The results that have been obtained prove that this self-temple have been obtained prove that this self-temple have been obtained prove that this self-temple have been admittenance, cas handle rock of practically any size ministenance, cas handle rock of practically any size class craft for any harbor transport. If desired, the self-temple of the self-temple of the self-temple of the self-temple of hours and the barge used as an ordinary lighter. The system is applicable to any type of barge whether prisons in applicable to any type of barge whether the prisons in Spirite and the self-temple of the Stuttenance of th

### WALLEY'S COWET AT ITS REIGHTEST

RENET ROBERS RUSSELL, FR D , PROFESSE OF ASTRONOUT

It may have seemed remarkable to many people that so long a time has elapsed since the first observation of Halley's counts at its present return, and yet it has not shown itself at all to ordinary eyes. The accommanying illustration (Fig. 1) will help to explain this when first detected last September with very powerful tolescopic and it was fire beyond the illustration of the and nearly as remote from the earth. At first the two

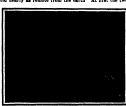


Fig. 4. Spectrum of Haller's comet

Photographed at the Yorkes Observatory by Prof. Frost, January 14th 1910. The appetrum of the comet is in the middle between the two brightest star-appetra. Nee description in text. The blue end of the spectrum is on the right, the situ-violet on the left.

bodies approached each other rapidly, but before the ond of the year our planet crossed the line joining the comet with the sun, and by January lat, as the figure shows, we were moving almost straight away from it During the early part of the year the earth and comet passed on opposite sides of the sun, so that it was less to our yele early in March.

About the time that this is printed it will come into sight sagain, on the other side of the sun rising before daybreak. But now its path has curved so that it is coming toward us—limed tirredly, if we take our motion into account as well as its own if therefore seems to stand almost still sanog the stars, while might tell by its more change in appearance that it was approaching us rapidly

Finally, about the middle of May the comet will apparently approach the sun again, and on the 18th it will pass in front of him, literally between us and the sun, transiting the latter's disk. If at this time its tall is more than Sirken million miles in length we will pass through it, as the Sirve shows.

will pass through it, as the ngure anowa."
The comet's closest approach to us comes two days later, on May 20th, when it is but fourteen million miles away. For a few days following this it will be splendidly visible in the evening sky, and then it will fade gradually as it recedes from us.

This clear from the diagram that this apparition of the const. is as exceptionally known in a special conf. for it is clear from the diagram that this apparition of the const. is as exceptionally known in the constant of t

nomically speaking, almost over our south pole, and quite invisible from northern latitudes. It therefore appears that the present conditions are almost ideally favorable for observers placed as we are, north of the

The illustration on the first page shows better than any verbal description where to look for the comet in the morning sky in New York The moon and Venus



Fig 1 —RELATIVE POSITIONS OF HALLEY'S COMET, THE RARTH, AND THE SUN

are shown in the positions which they will occupy shout May ist, when, on the whole, the come can be seen to the best advantage. At an earlier date, Yenus was higher in the sky, compared with the comet. There was less trouble then from moonlight, but the comet did not rise so early—about 4 A M on April 15th as against 3 A M, on the later date

The councils brightness when it appears in the even ing sky about May 20th will be sufficient to render any finding diagram unnecessary. It will only be needful to look toward the west half an hour or more before the council sets which it does at 8 20 P. M on the 20th 9 15 on the 21st, and 9 55 on the 22nd, after which it will be clearly visible until after 10 P. M.

Our other illustrations which appears here through the courtest of Profe Frost and Barnard of the Yerkes Observatory show the appearance and character of the comet earlier in fits apparation Fix 2 illustrates its extreme faintness at the time of its rediscovery (which was announced by Prof Wolf of Heldelberg less than a wock before the sarriest of the four photographs here shown was taken) while it was still do million miles distant, both from the earth and from the sum of any one piach it is difficult, if not impossible to distinguish the comet from the multitude in the same of the same of the same is also says one piach it is difficult, if not impossible to distinguish the comet from the multitude of faint stars around it, but no comparing the four which show exactly the same region of the sky? it is easy to see that the stars are the same in all, while

is easy to see that the stars are the same in an, vame the comet is 'here fedsy and gone to-morrow'. With the great Yerkes telescope (which gives far smaller and sharper images of the stars than can be reproduced on any known photographic plate) the comet was even at this time quite different from the stars in appearance, in Prof Barbard's words, "a feet, of light surrounded by a faith rebulosity" with no

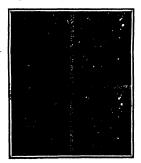


Fig. 2.—Halley's comet at its reappearance in 1909.

From photographs taken by Mr Lee with the two-foot refactor of the Terken Observatory. These four photographs represent the same parties of the sky. The arrows point to the count which appears.

He is find after his course from highly to highly.

definite boundary His measures, made on several nights, show that its actual diameter was about 12,500

Our second illustration, from a photograph takes when the come was 145 million miles from the sun, and 153 million from us, shows it already well ad awared in the changes which invariably accompany the approach of any considerable comet to its peribalion. The head of the comet has become larger—nor merely in apparent size, owing to its approach to us but creatly in miles, while a faint should be comed to a because the contract of the comet and the context of the come take the context of the comet and the context of the comet and the context of the context

away from the sun, makes its appearance
As Fig. 1 shows, the tail, which extends directly
away from the sun, was at this time also nearly in
line behind the head as seen from the earth so that
its actual length must have been much greater than
it appears to be—about five million miles, according
to Prof Barnath

This considerable development of the tail, while the comet was still at two and one-half times its least distance from the sun, makes it probable that at and after the perhelion passage, on April 20th it will be much longer, probably long enough to envelop the earth as it zweeps past.

Our third illustration shows the spectrum of the comet photographed on January 14th, when it was about 170 million miles from the sun

In taking such a photograph, a prima is placed in rota of the camers. The light of a star is thus drawn out into a line which, by leiting it trail on the plate is brademed into a hand, romeed by the dark lines which tell us what absorbing games exist in the star a stmosbler Most of the objects on the plate are the spectra of stars near the conset obtained in this way recommended to the plate are the spectra of stars near the rotation of the star of the spectra of the star indicts between the value of the spectrum of the star indicts between the which were produced by supplementary exposures on some bright star, and serves as reference marks to find the position of the lines in the spectrum of the consistent lited? The latter unlike that of the stars consists

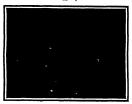


Fig. 8.—Halley's comet on February Srd, 1910.

From a photograph taken at the Yerkes Observatory by Frof Barnard.

As the instrument was kept pointed at the rouned during the exposure
the stars appear as short streaks. The actual length of the
comet a tall is about two million sales.

mainly of bright leands or lines three of which are conspit uous. The brightest of these as is shown by comparison with the hydrogen lines of the comparison spectrum is the so-called syanogen band at the or trene violet and of the visual spectrum. The others are probably as in the case of other cometa, also due to gaseous compounds of carbon.

Between these bright bands can be seen a faint con-

tinuous spectrum, due to refected similight. When the roomst first appeared the photographs made at the Life Observatory showed this continuous spectrum alone. At that time it must have been shining entirely by reflected light, but by the date of neillimitation it had already beam to be self-lumi nous. This is corroberated by the fact that fis bright mean increased may have more increased in the amount of reflected to the control of the

This intrinsic light of the comet, as its spectrum shows, is given off by luminous gas, but we do not yet know what makes this gas shine. It can hardly be high temperature, for the come the district come from the depths of interplanetary space, and did not yet receive nearly as much best from the sun as the sent office. It must however, be due to some kind of solar sarction, for it increases very readily as a comet approaches the sun. We can reproduce the same specially in the sent of the same special control of the same special

of carbon and nitrogen at very low pressure.
It is of special interest that, even if the carbon compounds form but a small percentage of the gas in the tube, that spectrum becomes relatively prominent when the pressure is made very small is any 1/100 one of that of ordinary air. It may be, therefore, that at ceptional capacity for shining, and it would be unasted to conclude that there are the principal gaseous con-

stituents of the comet, because they give off almost all the light

It may be added that the cyanogen bands in the spectrum are produced not only by the poisonous gas of that name but in all cases when carbon and nitrogen are together under electrical excitement. For example they are very strong in the spectrum of an ordinary are light where the aftrogen comes from the are and the carbon from the terminals. It would be about as prasonable to conclude that an arc light was potennous after looking at it through a specifrom a distance, as to make the same deduction about

Whatever may be the origin of this intrinsic light of comets it is responsible for most of the phenor which make them of general interest for almost all the light of the tall as well as of the head of a bright comet is of this kind. If Halley's comet shope by reflected sunlight alone it would be barely visible to the naked eye, even under the most favorable circum.

Actually owing to its intrinsic light it has be uous object at every return for the last 2,000 The only gap in the record—in A D 912—has lately been filled by the discovery of unmistakable references in old Inpanese chronicles.

the usual quantity of matter composing it must however be very small as compared with the more familiar heavenly bodies. It is possible to form a rough guess as to its amount by considering the amount of light which it reflects when it is not shining on its own account. From the estimates of magnitud made last September, it appears that a single bod made last september, it appears that a single body only a little over 30 miles in diameter at the distance of the comet would have sent us as much reflected light provided that its reflecting power was equal to that of the moon, which is lower than that of most of the planets

It is, therefore clear that the comet must be co posed of separate particles widely separated. T whole cross-section of the comet (12,500 miles in dia eter) is about 120 million square miles, while the total area of all the reflecting particles, according to the above estimate is about 1 000 square miles. A ray of sunlight falling on it has therefore less than one chance in 100,000 of being stopped, and all the rest of chance in 100,000 of being atopped, and all the rest of setting through some cuptly againer it is no wonder that commits are transparent, and that stars can be that commits are transparent, and that stars can be particles were, we could now estimate their number and their total mass. But here we are quite in the dark. As the light of the connet seems uniformly dif-lused and it shows no signs of resolution into points of light, the number of particles composing it must at least be counted by thousands. Their average diam-tations are the committed of the composing it must at least be counted by thousands. Their average diam-ms were moreonable in after it all sathered into may vary enormously in size if all gathered into one compact group they could at most hardly exceed in bulk the satellites of Mars or the smallest of the

But how much smaller than this limit their actual dimensions may be we do not know if, purely for illustration, we suppose that they average an inch across, there would be some five or six million millions of them. This sounds like an enormous number, but we calculate the bulk of the comet we find that there would be only five or six particles per cubic mile of space on the average inside it Near the center they would doubtless be more closely packed, and more thinly toward the outer parts of the comet.

The combined bulk of all these particles would be about 80 million cubic yards a large amount from the engineering standpoint but not equal to the quantity of water which falls within the limits of the smallest State in the Union during a heavy reinstorm

This may serve to give us some idea of the extreme tenuity of the comet as a whole - if we took a space as big as the comet, that is, half as much again in diameter as the earth, and sowed ordinary golf balls through it at the rate of two or three per cubic mile, leaving the intervening space absolutely valent we would get something that would look quite as bright as Halley's comet - if out alongside it when it first

The gaseous matter which gives most of the light at perihelion probably cozes out of the solid particles as these grow when under the sun's heat when they approach it As the gas becomes luminous under solar action, the brightness of the comet increases and its regions originally invisible because the number of reflecting particles was too small to influence our eyes, gradually come into view

me of this is repelled from the head of the com boile of this is reperied from the near of the counce, by little known, force, and driven away from the sun by the action of the sunlight which, as is well known, exerts a force of rejuision which, if a particle is exceedingly small as are the gasoous molecules, is stronger than the attraction of the sun

Thus arises the long and magnificent tail which, like the anoke-trail of a steamer at sea is ever being renewed at one end and fading away at the other, even though it seems to accompany the comet'in its'journey

As the comet recedes from the sun, much of this fine outs matter has thus been lost, never to be re-gained. Some of the remainder probably condemna-tound the solid particles when they become cold, and

es apes into space

The comet is thus gradually losing its s and in the course of ages it may be deprived of all its tall forming material, and lose its former glory This seems to have actually happened to some of the short period comets, one at least of which has disappeared altowath. r

Halleys comet is perhaps preserv fate by the longer interval between its returns to the region near the sun, where its activity takes place. It may be, too, that it has more of the right sort of material to spare for a tail But the time may con when most of this is lost, and its successive appearances may gradually lose those impressive features which have so long inspired awe and wonder in the hearts of mankind, and dwindle at last into something which the professional astronomer alone will be in

The Mercury Vapor Lamp and Its Effect on the Rye, About a year ago we published a reference to a report of Prof J Norman Collie, FRS, stating in effect that a German medical journal had described certain cases of alleged injury inflicted upon the eyes by rays of mercury vapor lamps. These cases referred to all prove to have resulted not from the mercury to all prove to have resulted not from the mercury vapor illuminating lamp, which is now so largely in use in this country and which is constructed with a tube or container of glass, but from a special lamp used in medical sterilization, and chemical processes, having a quartz container. The medical or sterilizing lamp, to be sure, uses mercury vapor, but its containe being of quartz, it is transparent to those rays which being of quarts, it is transparent to those rays which way be fulfillious to the syrs, while glass is quaque to such rays and does not permit their passage. The quarts lamps referred to by Prof Collie are inter-tionally made to centil perm-destroying raws Dr. Claries P. Richmett who has made a careful study of mercury vapor lamps used for illuminating pursecs, stated in an article in the Electrical World and Engineer of February 21st, 1903, as follows

The nicroury are therefore is the only known arti ficial illuminant which is perfectly harmless and thus especially suited for use where accurate work has to be done by artificial illumination, as in drawing rooms

offices, factories, et The same scientist in an article in the Daily Union, Schenectady N Y, on January 17th, 1903, stated as

"Therefore electric lights are less harmful than gas or oil lamps, being whiter, and the white daylight the least harmful while the mercury are light which is entirely devoid of red rays, is absolutely harmless, and a person can look straight into one of these mer ury area of enormous brillian y without being blinds by it

In one of Dr Steinmetzs books entitled "Radiation, Light, and Illumination" he makes the following

The harmful effect of working very much under artificial illumination is largely due to its energy effect, incident to a large amount of orange, red, and espe-cially ultra-red in the radiation of incandescent bodies used for illuminants and thus does not exist with 'cold light, as the light of the mercury lamp"

### The Current Supple

Prof R F Ruttan writes most interestingly in current Supplement No 1789 on the manufacture of alcohol from sawdust and other wood waste. A nov-type of automatic stamp-rending machine is describe and illustrated Prof Charles Edward Lucke write on the development of power systems. Prof Otto N Witt's paper on fast and fugitive dyes is concluded Witt's paper on fast and fugitive dyes is concluded Itarian I Smith presents some curious information on the wooden monuments of the Northwest Coast In-dians A blography of the famous Dmitri Ivanovitsch Mondelefel is published A method of instantaneous microphotography is described

Official Moteorological Summary, New York, N. Y., March, 1910. Atmospheric pressure Highest, 30 51, lowest, 29 47, mean, 30 8. Temperature Highest, 78, date, 29th and 30th, lowest, 24, date, 18th, mean of warmest and 30th, lowest, 34, date, 18th, mean of warmest day, 64, 5 date, 85th, cooled stay, 8, date, 18th; mean of maximum for the month, 524, mean of minimum, 270, absolute mean, 447, normal, 271, daily excess compared with the mean of 40 years, 72. Warmest mean temperature of March, 64, in 1963; collect mean, 35, in 1872 Absolute maximum and minimum of March for 60 years, 72 and 2, average daily excess also January 1st, 25. Precipitation 08s, present in 26 hours, 055; data, its and fast; average for 1 at 2 hours, 055; data, its and fast; average for 1 at 2 hours, 055; data, its and fast; average for the 25 hours, 055; data, its and fast; average for the 25 hours, 055; data, its and fast; average for the 25 hours, 055; data, its and fast; average for 1 at 26 hours, 055; data, its and 1 at 26 ho tion, northwest; total movement, 7,983 miles; avera hourly velocity, 10.7; maximum velocity, 44 miles ; Weather, Clear days, 13; partly cloudy, cloudy, 5, on which 0.01 or more of precipitation oc-curred, 6 Snowfall, 0.4 Mean relative humidity, 68.2. Dense fog, 2nd, 3rd. Sunshine, 69.2

### The Highest Dam.

At the hour of two in the morning of Sunday, January 16th, the completion of the Shoshone dam in Wyon-ing was announced. This is the highest dam in the l, being 3284 feet from the base to the pe world, being see a root from the base to the paragram. It is located in the profound canyon of the Shoshons River, in one of the wildest and most picturesque regions of northern Wyoming. The walls of the gongs are nearly perpendicular, and rise nearly 2,000 feet above the stream At its base the dam is 70 feet across; or top it is 175 feet in length, and at the base the dam is 108 feet wide

completion of this dam creates an enreservoir, having a surface area of ten square miles and an average depth of seventy feet. The capacity and an average depth of seventy feet 'rne capacity of this irrigation basin in gallons is something like 148,588,512,000. The construction of this great dam was attended with difficulty from the beginning, owing partly to the inarcessible section in which it stands. The dam is to control for all time the great floods of the Shoahone River and to provide an ample water sunby for the tripation of more than 100,000 acres of

supply for the irrigation of more than 100,000 acres of exceptionally fertile land in the valley below, a porti which is now available for settlers under the of the reclamation of

the contract for the Shoshone dam was let Septem ber 18th, 1905, to a Chicago firm for \$515,790 This firm, however defaulted, and the work was completed by another contractor

### Rallette ning Car.

When streets are cleaned by sweepers, whose brushes push the dirt before them, the dirt is sweep into the groove of the street railread rails and thes compacted by the wheels of the running cars. The rails accepted with dirt. Offer a greater resistance to the electric current, thereby causing a greater amount of power to be used for the propelling of the cars. The must be constantly cleaned to avoid loss of curre

The Hanover Street Railway Company has built for is purpose a special rail-cleaning car It is similar this p in construction to a regular two-axis car, and has two 26-hors-power motors Between the front and rear wheels on both sides of the car are steel brushes, which wheels do boild sluwe of the car are steel organes, which coloues the dirt from the rails. This dirt is automatically removed by a vacuum pump, and deposited in a box built into the lower part of the car between the axles of the driving wheels. The vacuum pump is axies of the driving whoels. The vacuum pump is operated by an electric motor attached to the dirt box. To avoid the raising of dust in dry weather, a sprinkler and two tanks, holding about 925 gallons of water each, are provided

As soon as the box is filled, an automatic alarm notifies the motorman who shuts off the pump, reises the brushes, and takes the car to a place where it can be emptied and made ready for another trip

be empired and made ready for another trip. This car can be run at any run of speed allowable in street traffic up to 17% miles per hour, and still in street traffic up to 17% miles per hour, and still man and the assount of poser track it as possible traffic and another traffic traffic and another transport of the traffic and saily as a verage of 46 miles of track, using according to weather conditions, up to track, using according to weather conditions, up to of dirt per mile of track

### Beath of Thomas A. Havendale

The founder of the box toe industry in this country, Mr Thomas A Baxendale, died at Brockton, Mass., on April 1st at the ago of seventy A native of England, Mr Baxendale came to Brockton in 1867 a poor man. The shoe industry was then in its infancy He entered In suce mousely was teen in its immary. He outered one of the large factories and invented the box toe which is now used in nine-tenths of the shoes that are worn. Later, with John Simmons as a partner, he founded the firm of T A. Baxendals & Company. He mivested many machines for producing shoes, most of which are now in common use. He died a wealthy man

### Beath of Thomas B. Joffers

Beath of Thomas B. Jashry.

Mr Thomas B Jeffry, who invented what is known as the clincher posumatic tire, died on April Brd. at Pompell, Italy He was for more than twurth-drey years a partner of the firm of Gormully à Jeffry, makers of blerjees. Registal by birth, he came the country at the age of eighteen, and settled in Chicago. He took an active interest not only in the development of the birgels, but in the automobile as well.

Beath of Funl Thredore storout.

Paul Theodors Stevert died January 11th, 1916, in Dresden. He was a wall-known German manifecturer and inventor. He is best known for an invention to which he applied compressed air for biswing, pissels of gloss of any desired sing.

## Scientific American

## Correspondence.

### WANTED-A RICE MULLING MACRINE

To the Editor of the ECHENTIFIC AMERICAN
Whoever will invent a machine to hull rice, will be
as great a benefactor to the rice farmer and the conas Eli Whitney in the invention of the cotton The farmer often gets 75 cents per hundred or for his raw product, and generally has his crop in ein. the mill for months before he gets this. The mills are huge structures because of the necessity for large grage, but the real mill part of the plant is shoul the same in machinery as a flour mill. The main processes are two, the removal of the hull and the processes are two, the removal of the null and the removal of the polish The former is accomplished by burr stones, but the grain passing from under these is not completely clear of the hull The next process is accomplished by a cylinder of wire cloth containing a revolving core of sheepakin with the wool on, which takes off the remaining hull and the outside of the grain as well. The native French of Louisiana pregrain as well "The native renem of Louisians pre-pare their rice by means of a wooden peatle, which removes the bulls and leaves the polish, the most nutritious part of the grain Usually the mills have an arrangement for coating each grain with parasin, but this is not even an improvement except in ap

Whoever will invent a small machine, say in size whoever will invent a small machino, say in size similar to a farmer's fan mill, that will remove the hull from the grain, will remove the rice crop from the enormous toll now paid the miller, and give a cheap and healthy food to the people as a superior substitute for the present rapidly ascending foodstuffs to which we have been accust There are large investments in the milling of the crop but it ought to be a paying investment with \$9.75 profit between the blanter and the consumer on each 75 cents received by the farmer C. W CAMPBELL

Johnston City, 111

## THE EFFECT OF REFRACTION ON THE TRIANGULATION OF MOUNTAIN SUMMITS

A REPLY TO MISS PKCK'S STATEMENTS IN THE PRESI

To the Editor of the SCIENTIFIC AMERICAN Since the announcement by Mrs F Bullock Work man of the results of the recent scientific and carefully executed measurement of the two summits of Mount ussemman by the professional engin Peru by her from Paris, Miss A. Peck has favored the press with communications, the evident purpose of which is to bolster up her assertions not based on any measurement data as to the height of that mountain by attempting to discredit the figures obtained by triangulation the most accurate method of measuring altitude known To effect this the communications centain a quotation and two statements, one of the atter absurd and self-contradictory in its to brought together as to tend to befor the mind of the prought together as to tend to being the mind of the reader and lead him to infer that in general the re-sults of triangulation of a mountain summit by an expert engineer are likely to be vitiated to an extent

expert engineer are likely to be vilated to an extent of 4,000 feet by refraction. The quotation from Mr. Mumm and the statement attributed to Dr. Collie, the one a publisher and the other a chemist by profession, activer of whom, so far as I know, has ever claimed to be an expert in altitude measurements, merely repeat in general (ergss what is well known to engineers that no method of determining the exact amount of refraction having been yet discovered, the present hoights of cretain high mountains obtained by trianguistion may be somewhat changed, either higher or lower, should such method be discovered in the future. Such change would probably not be great in any case, and in many cases surements, merely repeat in general terms what is would be very slight, varying from nothing to a few feet, for no coefficient of refraction that is likely to be

used would greatly alter the results now obtained Between the recognition of the fact that figures obtained by triangulation may not now be absolutely. though they are essentially, accurate, and the ridi lous statement asserted by Miss Peck to have been made by a nameless friend of a so-called 'former mem-ber of the British Royal Engineers' that he triangu lated the great peak K-2 and obtained a height 4,000 fest greater than that now assigned to it by the Indian Survey, which impossible difference Miss Peck would have the public believe is due to refraction, there is

nave the public objects in the or institution, that an impassable guil.

The possible discovery of an absolutely accurate method of determining refraction would affect chiefly the present attitudes assigned to certain very high Elimalayan peaks, such as Mount Everest, which were triangulated from very distant points low down in the adian plate, and to a less degree some other high halis also measured from distant stations. At the plants and measured from distant stations. At the Alterophich of a paper on mountain copioration read by see before the Rayal Geographical Society in Lon-tic in Newmonte, 1997, Shr Thomas Holdich, one of the many markets, there English engineers, for many years the heavy of India consumed in Hima-

king of the very high layan surveying, speaking of the very highest moun-tains said "We do not know exactly, and at present there is no means of determining, what the exact and the of refraction may be in those altitudes.

result of variation when applied as correction to those observed trigonometrical allitudes may be consider-To show what he judges to be considerable may ded his further remark, "Mount Everest will be add probably prove to be some hundred feet or so higher than we at present reckon it."

Observe that Sir Thomas considers one hundred

feet in 28,003 the present height assigned to Mount Everest, a considerable change in the sittude of that peak which is the most extreme case of all on account of its great altitude, its distance from the measuring of its great attitude, its distance from the measuring stations, and the large amount of moisture in the air above the hot, steamy plain of Bengal He does not for a moment entertain the figure of 4 000 feet said to be suggested by the friend of the British Royal Englineer If Sir Thomas's estimate be a probable one in this case, in the more favorable ones of lower summits measured from near stations the amount of

correction would shade down nearly or quite to zero Now Miss Peck supposes an allowance similar to the friend of the Royal Engineer's 4,000 feet made to the it of Huascaran and asserts, "it is easily happen that the mountain is one or two thou sand feet higher than it has been figured," which would bring it up well toward the altitude she has estimated it at. Such a supposition is not tenable Even if the 4 000 foot statement regarding K 2 were aven it the 400 root statement regarding K2 were true the conditions in this case are entirely different Her plan is ingenious but not creditable to her knowledge of the principles of allitude-measurement. Sup-positions have no place in this field. Observed facts are what count.

M do Larminst and his assistants, who are expert rs and know what they are about triangulate the two summits of Huascaran from four accurately d stations at an altitude of 12500 feet, in the immediate neighborhood of that mountain in perfectly clear weather Here was no immensa distance, no haze in the air no great beight of the summits above his stations, as in the case of the great Himalayan peaks mentioned, to cause any appreciable chance of error due to refraction. Refraction in this case, if not allowed for at all would be practically a negligible quantity. His results determined from four stations. racy, must be exact to within a very small figure Prof Fr Schrader and M Henri Vallot of Paris after a careful personal examination and checking of all M de Larminats observations and calculations have inon Larminata observations and calculations have in-dorsed them as correct. The indorsement of engine ra-of such worldwide reputation as they have is a suffi-cient guarantee of the accuracy of the work. Miss Peck may therefore rest assured that this triangulation will be accepted by engineers and experts as accurate and definitely settling the question of the altitude of the two summits of Husscaran

Miss Peck makes two other statements, the relation of which to the altitude of Huascaran is not apparent That I "improperly claimed" a world record with 23 394 feet, and (2) that Mr Graham's ascent of 23 384 feet, and (2) that Mr Graham's ascent of Mount Kabru, about 24,000 feet, twenty years earlier, is now quite generally acknowledged." Mr Graham on his return from the Eastern Himalaya claimed to have nearly ascended Mount Kabru as well as to have made a number of other high swents. He gave an nt of his experiences, in London His claims were very generally dishelloyed at the time and afterward by mountaineers and engineers, and were especially disputed by the Indian Survey, the members of which disjuted by the Indian Survey, the members of which were in a particularly advantageous position to judge of their truth. The grounds for discrediting his ascent of Kabru were saveral but the strongest of all, well known to the Survey officials, has never, it think, been published as the Survey did not enter the lists in print against Mr Graham Within two years I have had the opportunity of discussing the question with a retired surveyor general of the Indian Survey, who was in Calcutta when Mr Graham returned from his attempt on Kabru, and he expressed his disbelief in the

Some time after the event Mr Douglass Freshfield advocated Mr Graham's claim bringing forward no new evidence beyond Mr Graham's original account. new evidence beyond Mr Granm's original account, but basing his opinion on certain considerations of probability, which though specious were not con-clusive and did not convince the public He stood nearly alone for years Recently a few of his friends have expressed their concurrence in his opinion, and in the United States Mr E S Baich and Miss Peck have echoed the cry, though neither of them can have

have echoed the cry, nough seitzer or tasem can nave any knowledge of the question that can make their opinion regarding it of any value. The world at large has remained either neutral or dishelieving. It is noteworthy that Mr Graham had no .nstru-ments, not even an anevold, with him by which to determine the allitudes he claimed to have reached so that, as in Miss Peck's case his ideas as to his altitudes were based wholly on guesswork. It is also

ant, as an English journal recently stated, that after his account given in London, he never joined in the discussion that followed nor attempted by any further statement to defend his claim. Not long afterward he disappeared, and, so far as I have been to learn, his whereabouts have since remain

Mr Graham's account constitutes the only evider available in the question If anyone after reading this chooses to believe that his claim to have ascended Kabru is valid, he has a perfect right to do so, but such belief does not afford any proof of validity, not does it warrant the person holding it in asserting that Mr Graham's ascent is now quite generally acknowledged. The only verdict that can be reached, as the

atter stands is that of unproven In stating the above facts I wish it distinctly under stood that I am not expressing my own opinion as to Mr Graham's claim This I have nowhere done either in lectures or in writing although such expression has been ascribed to me by others
With regard to Miss Pecks repeated as

I 'Improperly claimed' a world record with 23 34 feet, my position may be stated as follows Although, as a matter of fat, this altitude attained by me in 1983, was and remained for several years the highest measurements. ured altitude reached on an ascent, and although I had ured artitude reached on an ascent, and atthough I had overy right to publish it to the world as a record, with two exceptions I have never mentioned it as such either in public or in print not even in the volume I'ee Bound Heights of the Mustagh," by Mrs Bullock Workman and myself in which I have described my Workman and myself in which I have described my ascent to that allitude One exception was a mention of it in one of the issues of Whos Who? The other was in connection with a paper on that ascent read before the Alpino Club in London th May, 1905 when I said

'The word record' in the title of this paper is us as referring to the highest substantiated ascent yet made in mountaineering. The contention that Mr Orabam reached an altitude of 24 000 feet has on various grounds whether rightly or wrongly been so strongly disputed that it must be regarded as far from proved and therefore the altitude mentioned cannot properly claim a place among those acknowledged to have been made

In this year 1910, so far as Mr Graham's claim is concerned. I see no reason to alter a word of that

In view of the above I do not think it would be in view or the above I do not think it would be courteous in m. to deprive Miss Pick of the distinc-tion of 'improperly claiming' a world record in which she herself has enjoyed a monopoly for the last two years. During that time her chief appeal to the in torest of the public has been not by scientific obsertions on natural phenomena at high altitudes but by constant reiteration in the press without the authority of any measurement proof of claims to the attainment of an altitude variously stated at from 25 000 to 23,000 feet which finally crystallized into 'It may be re garded as certain that Huasaran is above 23 000 feet If, as seems probable the height is 24 000 feet have the honor of breaking the world's record for mer

as well as women

Mrs Bullock Workmans engineers have now
stripped her claim of all its and probabilities and brought it definitely down to 21 812 feet the aititu of the lower summit of Huascaran she claims to have WILLIAM ILL STER WORKMAN

Effect of Rainfall on the Cotton Industry.
The amount of rainfall and the development of the cotton industry in any region are intimately connected. The first proof of this rather supprising assertion is found in the continual endeavor of inventors. to devise means of giving to the air of cotton spinning ms a proper and sufficient degree of humidity. But a deficiency of natural humidity cannot be perfectly remedied by artificial means, and it is a fact well known to all cotton spinners that the product of the known to all cotton spinners that the product of the spindles is considerably increased by the constant presence of a large amount of moisture in the air. The moist climate of Norwandy has made that prov-ince the chief seat of the cotton industry in France, and for a similar reason Manchester has become center of the English cotton manufacture. In addition to a moist atmosphere the cotton industry requires abundance of water in its visible form. Cotton milk are always located on or near streams and are pro-vided with capacious reservoirs

Hence the great diminution in the rainfall of the Manchester district which has taken place within the last half century is a valid cause for alarm Heaketh isst nair century is a value cause for starr reserve has collated the records of rainfall made between 1880 and 1908. He finds that the mean annual rainfall was 36 inches between 1880 and 1886 but only 27 1-3 inches between 1886 and 1908. The observed shifting of one of the branches of the Gulf Stream is suggested estble cause of this great decrease in rainfall which threatens the industrial prosperity of Manches

## THE DISISPECTION OF BAILWAY CARS.

The running of a railroad in Germany is evidently accompanied with unpleasantness, if one may judge accompanied with unpressantness, it the may judge from the accompanying photographs. The Poisdam shops, which are responsible for the proper main tenance of rolling stock, have been confronted with the difficult task of disinfecting the cars. It seems that the ceaches which return from Russia are literally aswarm with termin Even after the cars had been cleaned with true Teutonic thoroughness, there was still the possibility that living disease germs might still the possibility that fiving disease germs injur-lurk in the walls and hangings it was therefore, the practice for some years to take down all the uphol stern curtains etc. and to clean

rything thoroughly Natur ally, the expense involved heavy and the cars were with held from service for a consider-able time Moreover, there was also the danger of infesting the

shops and other cars

The problem seems to have been successfully solved by Julius Pintsch who applied to the rail way car a principle of disinfec-tion which has been successfully employed on vessels. His disinfecting apparatus consists of an iron cylinder hullt up of cast iron annular sections of 16 feet in-ternal diameter. The inside length is about 72 feet. The cylinder is so stoutly constructed that it can easily support without deformation a 30-ton car During disinfection the air

within the cylinder is considerably rarefied by a pump, and as a result, the outer air exercises a pressure of about 1,800 tons on

the disinfecting cylinder Since the apparatus in ed during disinfection allowance has to be ma for expansion Hence the cylinder is mounted upon rollers, so that the apparatus can yield to an extent of about three-quarters of an inch in length, which is amount of expansion

Before it is run into the cylinder, all the windows Before it is run into the cylinder, all the windows and transms of the car are opened By means of a trans a two-ton closure is brought against the opened of the cylinder A rubber gasket is employed to make the closure hermetic. Huge bolts hold the ineace are county negroots ruge polts hold the closure, gasket, and cylinder together Steam is blown into the interior of the cylinder Two hundred and fifty steam pipes line the interior of the cylinder, all receiving their supply from the main pipe total length of all these pipes is about 1% miles In

order to heat the air within the cylinder quickly and uniformly, two blowers are set in so that all the air is brought in contact with the hos Even during the cold her the temperature weather within the cylinder can be raised to 140 deg F in from one to hours in order to heat an entire coach to this temperature, about five hours is required. After the car has reached the proper tem perature, the air is pumped out of the cylinder until a vacuum of 74 centimeters of mercury under the normal pressure is ob-tained. At this atmospheric under the normal pressure is ob-tained. At this atmosphere, pressure water will boil at 104 deg F Hence all moisture is evaporated from the car without ring the parts by the exce heat In no other way is it sible to kill vermin effectually The uphoistery curtains, hang-ings etc., are not in the least in-

For very special purposes the cars may be disinfected with formaldehyde gas At the very first attempt a car was thor-oughly purged of vermin To make assurance doubly sure, and to test the efficacy of this formal

dehyde disinfecting method a glass vessel full of the living insects had been purchased from a professional vermin-exterminator in Berlin This vessel was placed in the car and covered with cotton and linen The insects were all killed

The apparatus has also been employed wet cars as well as cars pervaded with the un-pleasant odor of cooking. After twenty-four hours they were quite ready for service again. In this case no formalin was used

Liniment for Burna.—40 parts sugar lime, 10 parts glycerine, 30 parts carbolic acid oil, 3 parts saiol.

### SOVERHEEST IRRIGATION IN THE VARIES WATER-SHED -THE TIRTON CARTON CANAL BY DAY ALLEN WILLIAM.

The region adjacent to the Yakima River in south ern Washington is the location of a group of irriga-tion projects which are notable for the engineering The topography of the country reveals a number of areas of arid land, separated by hill rang which prevent water being distributed from a single source of supply The ongineers of the Reclamation Service have made an investigation which extended from the lower portion of the Yakima River to its head waters in the foot hills of the Cascades, and



The huge cylinder in which German railway cars are disinfected by steam and formaldehyde at Poissan after their return from a trip to Russia.

have planned five resorvoirs and distributing system which will have a capacity to irrigate no less than 350,000 acres, making this group of projects one of the most important in the West. The various works are the Tieton, Sunnyaide, Wapato, Kettitas, and Benton They have a water supply through the from four lakes and a submerged "meadow" having a total area of 574 square miles. While the lower section of the Yakima River is

used in part for what is known as the Bunnyside project, most of the service is performed by the Tietun, the Naches, and the Coxiche streams—amail rivors which are feeders of the Yakims.

Of the projects, the Ticton is most interesting from scientific stand; oint, owing to the difficulties s the route, the various applications of power, and the fact that without the use of concrete the proje

be impossible to build a tunnel or open canal upon it. Consequently, several miles of the conduit were supported upon hinges or arms of reinforced concrets ported upon hinges or arms of reinforced concrets anohored into the rock and extending outward from the canyon side. The Tieton project contemplates the irrigation of from \$4,000 to \$0,000 acres of land in the vicinity of North Yakima, Wash

As the water is conveyed along the precipitous side hill of the Tieton canyon, for 20 per cent of the dis-tance the canal lies in tunnels. The open canal sec-tions are of semicircular form, 8 feet 2% inches in tunnel sections are of circular form, 6 feet 1% in

or circular form, 6 rest 1% inches in diameter, with concrete shell 4 inches thick This canal and tunnel lining are made up in 2foot lengths, manufactured on the flats along the river bank, where concrete ingredients are readily obtainable, and lifted to the canal line by cable hoists operated electric power These hoists ud by electric power These hoists are used successively at points about two miles apart, and the concrete shapes are transported along the causi between hoists on railroad tracks laid in the bed of this vated route

This plan was adopted for the reason that beds of sand suitable for concrete were found in th bottom of the river. In fact the Tieton valley was made the site of a novel concrete works. The question as to how to transport them to the work was answered by the use of electrical power A series of tramways were built at convenient points up the side of the canyon operated by cable

the canyon operated by cable hoists. These hoists in turn were served by a series of electric motors souring current from a power size tion constructed for the purpose. The concreta as fast as mixed was molded to the proper dissensions in a portable molds mounted on whoch, so that they could be drawn from pisce to piace. After hardening had taken piace, the forms were set upon trucks having sides of steel frantwork. These trucks were mounted on the trainway, and the material hauled to

mounted on the tramway, and the material haused to the top ready to be set in place. On the Tieton project 10,000 feet of tunnel wen-necessary, divided into two services of 3,000 feet each and one of 4,000 feet. In sectivating these much of the formation was found to be of black beautir rock requiring special machinery to ensure it. In making other than the second of the second of the second etc. The second of the second of the second etc. The second of the second of the second all of from 50 to 0 feet per mile, and setvating was taken of

mile, and advantage was taken of this to develop the power re-quired for operating drills and other machinery and for lighting purposes A power canal 3,500 feet long, of 180 second feet maximum capacity and 34 feet effec-tive head, has been completed, which supplies water for operating a Franklin air compres ing a Franklin air compressor capable of compressing 1,260 cubic feet of free air per minute to a pressure of 105 pounds per inch, a Westinghouse generator of 120 kilowatts capacity, and one set of 26-inch twin turbines. About 500 horse-power is developed, ample to operate the six electric drills, six air drills, shop machinery, pumps, hoists, etc and to light all the camp build inm. The turbine is regulated by ings. The turning is reguinted by a governor, and the power canal is provided with an ample automatic overflow, just below the power house. An electric transmission line, carrying 2,200 volta, has been constructed to the upper

portal of Trail Creek tunnel, a distance of seven miles. Electric drills are being operated at the two portals of Trail Creek tunnel, and at the upper portal of Tieton tunnel. At the lower portal of Tieton tunnel, and at both portals of North Fork tunnel, air

drills have been installed.

Another difficulty in the way of building the Tieton

ABOURT officers of the way of building the Trieston project was the crossing of a number of ravines carry-register was the crossing of a number of ravines carry-tics. The control of th



Scaling the cylinder with a two-ten gusketed closure before exhausting the air and turning on the steam.

### THE DISISPECTION OF BAILWAY GARS

would have been impossible. This stream flows through a deep canyon with very steep sides, the height of the bluff ranging in places as high as 400 feet from the bed of the river to the level of the canal The water of the Tieton is diverted by means of a concrete dam thrown across the stream Although of a concrete dam throws seroes the stream. Although but three fort high and 200 feet long, the reservoir hus made is sufficient to fill a main cann 13 miles. In coaveying the water from the dam to the point of distribution, the only practical notes which could be located was imprivationg the side of the coayen near-the top, ther im being of such formation that it weeks to go, the rim being of such formation that it weeks

## Scientific American

Fields project is very small considering the work which had to be performed and the arroam which will be served by the water. A truck which will aggree will be served by the water. A truck which will aggree work it was necessary to have a telephone line 38 miles in length, wagen roads along the route of the canal, and tunnels as well as temporary settlements for the workmen in the valley and on the rim of the

Increased Goot of Army Haddens.
The numerous published seconds of high prices of food and smallers which have been indicted upon the working many the property of the second property of the second property of the property o

tioned before the price of bacon has so increto make the change desirable

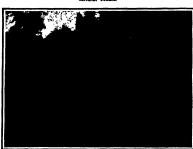
The garrison ration is studily increasing in price because of the general rise in the cost of food products. When the estimates for army substainence were made tast May for the next fiscal year, it was assumed that a ration would cost 2007 cents. By Jahnury of this year the cost had increased to 22 cents, making



The canal consists alternately of open semicircular concrete conduits and circular tunnal.



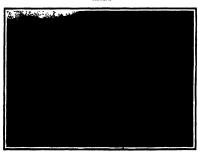
Building the open section of the Tieton conduit. Note the weeden forms for the concrete,



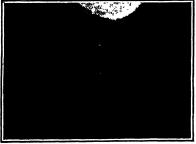
One of the portable melds used in forming the concrete facings of the



The molding yard, showing the concrete lining sections ready for delivery at the canal



The 4-inch concrete lining was built in sections in the valley and lifted to place on the side of the canyon.



Side-hill excevation for the Tieton canyon

canyon. The land, however, is especially suited to the raising of forage, fruit, and hope and is located on three important rainroad lines having connections with the principal cities of Washington.

Oliment for Burns.—Indatorm, 80 parts; extract of confi. 40 parts; onrboile acid, 1 part; rece unguest, and parts.

COVERNMENT IRRIGATION IN THE YARINA WATERWED .- THE TISTOR CANYON CANAL. To those of us who served in the Spanish war, and had the canned or corned best served us as a part of the regular ration, the new will not come as a surprise, but the man who reads this will undoubtedly think of the good betwhe get as home and wonder why complaints about he made.

One particular reason why the army will now use carned best is from the point of economy, for as meaning the server of the se

It necessary for the War Department to submit a de-ficiency estimate to Congress. If the present rate of increase keeps up, the cost will be nearly 23 cents by the one of the next factsl year. When it is considered that the army annually consumes several millions of rations, it will be seen that an advance of even a fraction of a cent in a single ration means a big ad-vance in the aggregate for a year.

## NOW GAMBLES CHEAT

Games of chance have always had a fractination for all classes of individuals at all ages, and the profes-sional sharp has made this weakness (which in some persons is developed into a ruling passion) a some persons is greedoped into a runing passion) as means for carding an easy livelhood at the expense of the numerous flats' who visit to keep course or other places where gambling is looked upon as a more or less keltimate pustim. The linguitious mechanical devices which have

ben employed for this purpose are really astonishins. Such clumey appliances as louded dien are, of course out of date though one ingenious sharp invented a table the top of which was sheet steel under a very thin cloth covering. By means of an electro-magnet concealed means or an ejectro-magnet contracts within the table, its top could be converted into a powerful magnet, and the dice (whith were prepared by having one side of metal while the rest were itory) could be attracted to the table when the current was on or would fall in any buzard position when the current was shut off Dice, however are generally suspected and hardly anyone would ven ture to stake money upon the fall of the dice any more than he would upon three card monte

Cards are the most fertile field for the umbler's revenue. Winning at cards depends largely upon the possession certain high cards or the aces which win the tricks and to gain possession of these cards is the gambler's object. For assuring this various devices have been employed called 'holdouts' mechanical ployed called 'holdouts' mechanical trivances concealed in the sleeve which by a very slight pressure or movement in one direction, will instantly shoot out the required card into the gambler's hand and recede again into sleeve One of the most ingenious and perfect of these was invented by a r named Keplinger and the gamoser stance Kepinger and the de-vice has ever since been known as the 'Keplinger holdout' The apparatus was worked by the knees, so that no motion

worked by the anews, so that no motion of the arms or body was necessary A slight separation of the knees was all that was required to shoot the card into the gambler's band. The knees were thereupon relaxed and the "holdout" recoded like a fiash into the sambler's sleave

Another variety of holdout is that concessed in the waistcost, and here the hand is held close to the body with the cards outspread while the thread is pulled, and in that manner a card shot into the hand cover of the remaining cards This however is a dangerous procedure which is rarely employed small but ingenious species of holdout" is that known as "the bag". The small sharp point seen in the illustration is stuck into the wood of the u

side of the table in such a man ner that the flat bar runs along parallel to and just touching the or more cards are now inserted into the clip thus formed, and may be withdrawn by the fingers in the act of drawing cards on the table toward the

A daring yet simple variety of 'holdout' is attached to the sleeve it is buckled around the shirt sleeve under the cost and two small pointed books faring outward press against the coat sleeve These hooks may be separated or brought nearer tagether by pressing upon a small rubber If now a card be pla against the coat sleeve, on the outside, and the clips separated outside, and the clips separated and then released, they will class the edges of the card through the cloth of the cost, and it will be retained there by the pressure of the spring in the "holdout." Bo long as the arm "holdout." Bo long as the arm be held downward, the card is invisible, but the card may be

obtained possession of by the fingers of the other hand when resting against the sleeve of the arm to which the "boldout" is attached

A still simpler device is to have a small pocket out in the coat sleeve at the seam. The "pocket" is merely a slit about three inches long, into which the required card is inserted. The fingers grasp the card and withdraw it with the others at the required moment. Another variety of "holdout" is known as

the 'ring holdout." A ring is worn on one of the fingers, to the inside of which is attached, as part of the ring, a small wire oilp or spring, fiesh colored The card is inserted under this spring, and in that The eard is inserted under this spring, and in that manner is retained within the paim of the hand by the pressure Experts in aleight-of hand would not require a city of this character, being enabled to paim the eard without any mechanical aid.

sides such devices as those just mentioned, the



THE READORATE OUTSIT OF THE GAMBERS.

gambler depends for his success partly upon his dex-terity in handling the cards during the actual progress of the game. Of course marked cards are progress of the game. Of course marked cards are frequently employed for this purpose but the expert gambler will succeed in marking the cards with his thumb nail during the course of the play, so that, at the end of a few hands he knows practically every card in the pack from the slight indications upon its back Bometimes, also cards are bent more or less slightly to insure their recognition—either individual cards or a number of cards together. If half a pack is bent in this manner this is called "the bridge" Kach card in this section then has a slight curve, as



SOME GAMBLERS TRICES WITH CARDS.

THE PARTY OF THE PARTY OF

A gambler may even deal to himself or to any per-son forming the circle a particular eggrd which is known to him. This eard is at the bottom of the pack, and the 'sharp' deals of the cate from the top of the pack rootineously until he reaches the person into whose hand he desires to pince the card over it to him, which, ye a regist movement, he with-drawn, not the top by the bottom card with his Lagaru instead of his, distant. This trick, when

rapidity and wall especified, is practically undetectable.

Clard "sharps" also outpley other devices for galaxing knowledge of the cards dealt to every member in the In order to go circis. In order to gain this movements, a small mirror is employed. Songetimes this mirror is at-tached to a needle point, and fixed to the under side of the table nearest the destr if, now, is dealing, such card be passed over the mirror in turn, the gambler will be enabled to but the position of each card dealt, and to follow the cards before card dealt, and to follow the cards before

a single play can be made. A mirror of this character is a dangerous device, and it is easily detected. For this reason, very ingenious schemes have been em-ployed, A small mirror is inserted into ployed. A small mirror is inserted finic the bowl of a pipe, side carelessly on the table, the bowl being turned slightly upward and toward the dealer. Now, in dealing the cards, they are passed such in turn over the bowl of the plps, and in this manner the magnifying glass it con-tains conveys to the "sakary" all the re-cuired knowledge as to the cards con-tained in each satter's hand. Constituent in "sharps" employ a mirror ring for this which during the course of play, is swung around so that the signet faces the paim instead of the back of the swung around so that the signet faces the paim instead of the back of the hand. The signet then swings open on a pivot hings and discloses a tiny magnifying mirror beneath. By the aid of this mirror, the majority of cards can be detected as dealt At least acres and court cards can be distinguished from cards of lower values, which is the chief there to be discoursed. thing to be discovered

There are a number of other ingenious devices employed by professional sharps, but the above will at least give the reader an idea of the extent to which this practice has been carried, of the re markable ingenuity displayed by ma facturers of such devices, and of the dexterity and daring of the gamblers thomselves in employing them.

Bacrographic Bramination of Motals The macrographic examination nictals consists in examining with the naked eye the surface of the metal, which has been polished and chemically treated in such a manner as to bring out chemically treated in suce a manner as to bring out its constitution and its impurities. In micrographic or microscopic examination the particular objects of study are the character and chemical properties of the alloy, while macrography concerns itself with the physical properties. The principle of the methods used is as old as the first methods of damascening. in which an acid mixture was employed which black ened in different degrees the strips of iron and stor which had been welded together in the formation of

The operations of macrography are essentially two
first, the preparation of the pollabed surface, which must be absolutely free from grease, secondly, the chemical treatment, which is preferably effected with dilute sulphuric acid, in which the entire piece of metal is immersed for several hours. or with an aqueous solution of fodine and potassium iodide. The indications furnished by the examination of the surfaces thus treated are useful in determinists the smaller of steel and the surfaces. mining the quality of steel and detecting the presence of siag and of blowholes When a bar of metal is cast there is freor mean is cast there is re-quently produced near the sur-face a blowhole which is filled with the more fusible impuri-ties. Usually this pocket exties. Usually this pocket are tends through one-third of the thickness of the bay Macro-graphic methods show whether the blowholes have been ealth-erated either by pressure or by removal of the upper part of the bar, and they are also esp-able of detecting in forged house transact of these besides. pienes traces of th which have been left after the tooling.

The statistics of the American Railway Association show that the net surplus of freight cars on the rails

show that the not surplus of freight care on the ways of the country on Pebruary 18th was 1,4.00 against 24.975 on February 2nd; 26.546 on: Jan 18th; and 25.416 on January 2nd; 26.546 on: Jan thend for how care and four, close how his one to call late service 4d late, and the how the

## Scientific American

### MIS FIR TREES OF THE MORTHWEST

The fit trees of the Pacific Northwest occasionally attain such proportions, especially in the territory near Puget Sound, that the stumps after the trees have been cut down are employed for novel purposes. In some portions of Washington one can see these bugs of the property of the proposed of the province of the property of the pr stumps, which have been hollowed out and actually made into temporary homes for settlers. To make a stump house, it is only necessary to remove the material from the interior, leaving enough to form walls terms from the interior, sewing enough to form wass of suitable thickness. Then a roof of boards or shin gles is put over the top of the stump, holes are cut for windows and doors, and the dwelling is practically ready for occupation. A number of these stumps have been used by settlers on what are called logged-off. been used by settlers on what are called legged-on lands, until they have been enabled to construct larger and more convenient dwellings. After thesetump home has been vacated, it is turned into a stable for the horses, or sometimes into an inclosure for chickens

or hogs.

Next to the big tree of California, or sequola
as it is termed by the scientists, the fir as
found in Washington and Oregon
has the largest dinnater of any
tree in America, and probably in

the world Some have been cut down which actually measured 15 feet in diameter at the point where the incision was made. As they decay very rapidly after the timber has been removed, usually the in-terior can be hollowed out with little difficulty Sometimes they are used for dancing platforms, is shown in the accompanying illus tration, some being large enough to accommodate four couples. An other custom is to turn the big stumps into playgrounds for the stumps into playgrounds for the children, who reach the top by pieces of word nailed against the sides or by ladders, and a pretty sight which a traveler often sees in the northwest is one of the big stumps turned into a flower bed and covered with the trailing vines.

# How to Repair and Clean Typowriters, av Louis A FLANKING

As every user of a typewriter knows, the platen or roll is the part of the machine that wears out first The constant hammering of the type against the surface of the platen soon makes indentations in it, which in a short time amount to such a degree of roughness that it is impossible to produce good, clean work

discovered that will restore the platen to its original smooth condition no matter how badly it is worn or how long it has been in use The formula and method of using

The formula and method of using the compound are as follows The ideal material for use in repairing platens would be hard rubber, but in the process of vulcanizing, the rubber becomes insoluble to a great rubber becomes insoluble to a great degree in the solvents generally used for making rubber solutions. As a substitute for hard rubber celluloid is recommended The hard variety should be used, which is sold under the name of imitation ivory. This is soluble in acetone, amyl acetate, and various other solvents One of the best solvents

is a mixture of eight ounces of acetone and one ounce of amyl acetate.

In the absence of anything else in the way of cellu-id, any ordinary article made of this substance, as a

loid, any ordinary article made of this substance, as a could, may be used There is a variety of colluioid used in the manufacture of combs which is quite sat-latedory for this purpose. The color also is good with the collusion of the color also is good to the collusion of the color also is good to the collusion of the color also is good to the color and the color and the color and the substance of the color and the color and the finally providend silles, incusorial earth, energy, or other similar substances. About one ounce of power-eners to each eight ocuses of compound is a fair pro-portion. Providend component as the vorbs well for the

The celluloid solution should be made as thick as a very heavy syrup or molasses. In fact, as thick as a very newly ayrup or monamen. In fact, as table as shap be apread with a brain. The heavier it is when jied, the sconer it will dry. It a light colored celluloid is used, it is advisable to add some coloring matter, which may be immibiliate or predicably may or earlies. The desired should be used to give the desired grayish color Remove the platen from the machine The work may be done with the platen in the machine, but great care must be taken to protect the working parts from the dust formed when smoothing up also takes less time to do the work when the platen is

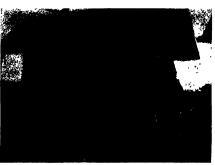
removed
Wash the platen with gasoline to remove all grease
and dirt, and rub it with a piece of fine emery paper,
to gite it a new, clean surface With a brush, paint
the mixture carefully over the platen, giving it a good thick cost

Lay the platen saids for six hours or longer fo composition to harden. Then with a piece of fine emery cloth smooth it down, taking care not to cut quite to the original surface of the platen. This is the delicate part of the work, and upon the care used in doing it depends the quality of the job

coung it depends the quality of the job Actions and amy acctate can be obtained at any drug store. It usually requires from two to five hours for the celluloid to dissolve. Breaking it up into small pleces hastons solution. The solution should be prepared in a wide-mouthed bottle that can be securely



A FIR STUMP IN WASHINGTON, BIG ENOUGH FOR A DANCING PLATFORM



STURP OF A FIR TREE IN WARRISOTON WEIGH SERLITERS A FAMILY OF FIVE

corked it should be shaken often during the process
as this will prevent the colluloid from forming in
lumps The bottle should be kept tightly corked and
away from fire, for it is highly inflammable Should
the mixture become too thick, thin it with a little more celluloid

cellusid
A cheap and simple cleaning compound for type
writers is composed of the following ingredients
Parafin oil 1 pint
Benzol 5 ounces Cresol 1 drachm

Rerosene
Mix thoroughly
This compload was for years a secret confined to
see or two of the large companies that rebuild type
writers. The mechine is immersed in the compound
which quickly and thoroughly dissolves and removes
all dirt, quan, grease etc. It does not injure the
same, but on the routinary improves the appearance
making it as bright as when here. In making up any
desires quantity of this compound results the propor-

ons given in the formula, except that should s quicker drying mixture be desired the quantity of paraffin oil may be reduced and the kerosene increased In all cases the lightest grade of paraffin oil should be used and not the heavier lubricating oils If white paraffin oil is used a water white fluid is produced, if dark paraffin oil is employed the liquid has a light amber color Oil of citronelli or oil of sassafras may amber color our curvacui or on or beneating may be substituted for the cresol which has no action whatever and is used simply to disguise the composition of the compound for the compound for authern the same with it. Place the machine in it and allow it to remain in the fluid for half an hour Bv litting it up and down gum and grease will be washed ing the parts not accessible with the cloth. About t The compound may be used as long as any of it is left as the dirt settles to the bottom of the tub and the clean portion may be drawn off—it is necessary to keep it covered tightly when it is not in use to prevent exaporation of the benzel. A fair preparation may be evaporation of the benzol

made by using one-third the quanformula an equal quantity of kerosene and from one and one-

## The Transformation of Sea Water

Into Fresh Water The belief was prevalent among the savants of the 17th and 18th carthen vessel dipped into the sea, would fill itself with fresh water At the present day it is difficult to say on what this is lief was grout It surely could not have be ιd to it surely could not new over tooked by Cyperine it in a similar sense Marsigli, the founder of occanology made in the year 1725 an experiment which effected filtration of sea water through system of fifteen pots filled washed garden-surth or sand and placed as to let the water fall as if in a cuscude. It is stated that the palate disclosed a definite diminution of the presence of salt Similar assertions are everywhere urrent among semmen A scientific test of the endeavor

to free sait from water was recent ly made by the French investigator Thould His report which appears in the minutes of the Académie des Sciences of Paris states that the presence of sait can be reduced by filtration Forty Cutimeters of the length of a glass tube which was one meter long and was placed in a perpendicular position was filled with seasand and the rest of the tube was filled with scawater por tions of the filtrate were exam at intervals of the experiment to ascertain its density and chemical composition. The result was that in the initial stage of the experi ment density as well as saline con tent were found to be moderately very soon thereafter both recovered their original value arly decrease of value is explain by the mechanical attraction which every chemically meetra; body exer stance in solution as toon as the body comes in contact vith the so

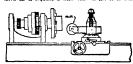
lution in nature too eend falls to effect the separation of sait. Through shipwrecked scamen it became known that relatively fresh water may be found on very low and harren corn! reefs in the Pacific Ocean by digging to a triffing depth in the coral sand. It is not however as was supposed sea water freed from sait through the layers of sand but is simply rain water that is retained by a sand; atratum and by it protected from admixture with the sea water Similar phenomena may be observed on the European coasts. They may be considered the key to the popular belief now contradicted, that sea water can be sweetened by filtration through sand

According to the Electric Railway Journal a novel type of electric locomotive has recently been built for canal haulage near Bromen The locomotive runs on a quay which has to be kept clear for the passage of drays and for other purposes. To secure the increasing weight for adhesion it was divided to build the loco motive in the form of two U's with a connecting girder. The current is taken from overhead wires.



### A TOOL FOR CENTERING WORK IN A LATER HY II D CHAPMAN

The accompanying drawing shows a handy tool for centering work in a lathe chuck When a job is to be faced off it requires a little time to get it to run



## SIMPLE METEOD OF CENTERING WORK IN A LATER.

true The drawing shows how the work can be expedited by the use of a simple tool. The tool is made of tool steel, the roller is hardened. When a job is placed in the chuck to be faced off and the face of the work does not run parallel with the face of chuck the work owe not run appraise with time rate of cruck the roller tool is secured in the tool post, and the lathe carriage is then run up by hand until the roller strikes the face of the job As the work wobbles in the chuck the high position will be struck by the roller and forred true with the face of the laths. After the work forced true with the face of the lathe. After the

STREETS A LEAK IN A STRAN OR WATER PIPE ole will occasionally cause a loak in a steam ter pipe, after the piping has been put up and ps been in use for a considerable time. It can be repaired with an ordinary carriage clip and you



MENDING A STRAM OR WATER PIPE.

and bit of sheet rubber packing, although a piece of an old rubber shoe would last for years

an old rubber show would last for years. You can readly see the application by referring to the sketch. The writer stopped two leaks in steam pipes affects parsa sate by this method. The pipes have been in service ever since and have not leaked. They see both in rather inaccessible places, where it would have been difficult to renow the pipe. At the same time being in out-of theway places the appearance of the patch did not master.

## GROOVED PULLEYS FOR EXPERIMENTAL WORK

Small grooved pulleys or sheaves can of course be turned on the lathe but a substitute for the lathe which in some respects is quicker and cheaper, will be found very advantageous The description of such ethod follows

a method follows in a piece of wood of the thickness desired for the pulley bore a hole of a diameter equal to that of the pulley at the bottom of the V-groove With a half round rasp or large drill countersink this hole on b Split-do not saw-the board in two down the



MOLD FOR CASTING PULLEYS.

middle of the hole, then nail or clamp it tightly to a smooth board the two halves being pressed firmly together. Find the center of the bole with a company and drive in a headless nail taking care to get it vertical, to serve as a "core" for the bearing Have handy a piece of cardboard considerably larger than the pulley, with a hole in its center the size of the nail Pour melted solder into the mold, and quickly

silp the cardboard over the nall and down upon the slip the Cardonard over the ania na urbu upon mind This will force out superfluous metal and make the upper side of the pulley smooth When cool. Incamp the mold and pull apart where split. A knife or rasp will then do all the finishing necessary Two or more pulleys can be cast together by placing the molds one upon the other, with their centure common. The figure shows such a combination. A hub may be made in a similar way if a stronger bearing is wanted, as for an idler, wrap a strip of brass around the nail and lot it become soldered to the metal

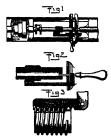
let it become soldered to the metal
Along similar lines a cogwheel may be cast, but
great care is necessary in cutting the tech in the
wooden mold A large number of pulleys can be cast
from one mold, and for duplication work this method will be found guicker than the lathe.

## HOW TO GUT THREADS WITHOUT A SOREW-GUTTING LATRE OR THESAD-URASING TOOL

The ordinary way to cut a thread by hand is to use a thread-chasing tool with the number of teeth per The difficulty in chasing a thread is in inch wanted inch wanted. The difficulty in chasing a thread is in the starting. It takes a great deal of practice, and even then a 'drunken' thread may be the result. The accompaning illustrations show how this can be done in a very simple way and yet give an abso-

lutely true thread

If a number of screws are to be cut the best way to proceed is as follows Take a thin piece of tubing that will just fit over the bar or bolt to be threaded d drill a small hole, into which fasten the end of a spring brass wire, preferably by soldering Then wind the wire around the tube half a dozen or more turns Now take a thread gage Select the number of threads per inch wanted and place it length wise of the tube, bringing one turn of wire in each



SCREW-CUTTING ATTACEMENT FOR LATERS

notch, after which pull the free end of the wire and keep it tight Solder the colls to the tube, using only the corner of the soldering from then move the gage one-third of a turn around the tube and repeat the soldering and finally move the gage again an equal distance and solder

It will now be seen that there is a perfect thread or spiral around the tube, which we will call the master thread. This master thread must be slipped on the bar or bolt to be threaded so that it will not turn, allowing enough room at the end for the threads to be cut. The cutting tool consists of an ordinary hand tool, with only one point. Procure a small piece of wood, long amough to reach over the master thread and to the end of the boit. Into this piece of wood and to the end of the boit. drill a hole just large enough for the cutting tool to

slip through and fit snugly
In operation the cutting tool is held in the right In operation the cutting tool is held in the right hand, in the usual way Then with the left thumb press the piece of wood against the master screw and start up the laths. The master screw will feed the cutting tool the right pitch. As soon as a good start is obtained the tool will feed itself without the aid of the master screw

When the thread is finished the mester screw may when the thread is finished the master serew may be removed and slipped over another bolt to be threaded. The spiral may be wound right or left, according to the direction wanted Any number of threads may thus be formed. That is to say if a triple or quadruple thread is wanted, it is only necessary to wind three or four wires around the master thre and proceed as before described. This arrangement is also very handy in starting a thread when the ordi nary chaser is used, as it will always insure a straight thread. It is not necessary to nick or mark the wooden block, as it readily takes the impression of the thread from the master screw

Fig 1 illustrates a plan view of an ordinary lathe, ready to cut a thread Fig. 2 shows how internal threads may be cut and Fig. 3 shows the master thread.

## STRIPLE METEROS OF PERDING THE CHITER OF A GINGLE.

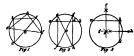
Very often it is necessary in the drawing room or shop to find the center of a circle, a disk or a p of shafting, etc., when the diameter is not given low are three ways in which this can be done

low are three ways in which this can be done.

The first, Fig. 1, is the method usually used it consists of two right triangles drawn so that their angles are in the circumference of the circle as a be and d e! The point where their hypotenuses intersect is the center of the circle.

The second method is shown in Fig. 2 Draw any chords as 6 and take two points on it as of equidicant from its ends. At those two points erect perpendiculars it comes in the contract products as the contract products are the contract the contract products and the contract products are the contract the contract products are the contract the contract the contract products are the contract the contract the contract products are the contract the contra

diculars to a b cutting the circle at efg and h



THREE WAYS OF FINDING THE CRUTER OF A GIRGLE

draw . h and fg. and the point where they inter-

araw of and fp. and the point where they intersect will be the center of the circle Fig 3 is similar to Fig 2 Draw any two chords as ab and cd and at their centers erect perpendiculars to them The point where the perpendiculars meet will be the center of the circle

## HOW TO SHARPEN A PIPE DIE.

this being due to the grease on the die Just as soon as the greasy surface is thoroughly worked off.



A PIPE DIE CAN BE SKARPENED WITH A FILE.

the file will commence to cut, and will cut very amounthy making a keen edge on the cutting thread Heretofore I have always worked on emery grinders to try to do this work without removing the temper of the die, but found they worked very slowly on ac-count of the small diameter of the wheels, also that it was quite a nuisance to set the die for the cutting wheel Most mechanics would not try the file not having the least idea that it would do the work That

## A "SPARISE WINDLASS."

Herewith is a sketch of what is known among

Herewith is a sketch of what is known among cowboys as a "Spanish windiass".

One end of the rope is made fast to the load, the other to a "deal man." tree, or fence post. The vertical post or timber which is used as a furn is rotated by means of a bar placed in a nearly horizontal post-



A "SPANIER WINDLASS."

tion bearing against the vertical post but not fast-ened to it. The rope is passed around the end of this borisontal bar

horizontal bar
One man holds the post against the ground and
vertical, and a second man withs around with the
bar passing it above the rope, and thus winding the
rope on the vertical post.
The whole windings moves toward the "food mag?
as the rope in weeds on, or no previous and in the

## Scientific American

made in the ground for the vertical post to turn in is is very useful for pulling wagons and he mud. All one needs is a rope and autos out of the mud. two posts or timbers.

## THE WRIGHTING OF TOOL HANDLES.

How often it occurs that when a tool such as a rad awl or particularly a keen-edged chisel is thrown own in a hurry it will roll off the bench and fall upon the floor, perhaps into a give pot or upon the foot of the workman, or on a hard surface that will nick or dull the cutting edge The following little scheme is dull the cutting edge The following little scheme is employed with all the wood-working tools of the writer and found to answer admirably. Bore a hole in that part of the handle that resist upon the bonch, with a five-slighthe rather dull cutting twist bit. Horse the hole only as far as it he center of the handle, but no farther, or the object desired will be debasted A dull cutting the makes a rough-sided hole fint this pour semmented less (or current the leaf should not be too hol? When the leaf debounds set, trial it off evenly with a fine rasp and finish off with coarse sand paper New when the tool is thrown down hurriedly upon the work bench it will not roll over more than once and will come to rest leaded side down. This little dodge is not only inexpensive, it is thoroughly effective, it will not only save annoyance, it will prevent n accident, which no one can realize more than the man who is handy in the use of wood working tools



READ AWLS WITH HANDLES WEIGHTED TO PREVENT BOLLING.

The illustration shows two brad awls, fitted as described, and used by the writer for several years.

## AN ILLUMINATED GAS REATER.

The accompanying illustrations show how an il-luminated gas heater can be made. The heater is mounted on a suitable pedestal, such as a wrought-iron stand or a base of some old discarded oil lamp The heater proper consists of a burner A, a screen B, and an outside cover or shield C, which is removable.

A suitable handle is provided at the top of the cover

for this purpose

Through the base passes an ordinary gas pipe, and
at its lower end a stop-cock is fitted with a suitable
attachment for a rubber hose so that it can be connect
ed to the gas supply in the usual manner At the upper
and of the gas pipe is attached an adjustable sleeve for regulating the proper proportion of air to be mixed with the gas. The sleeve terminates in the burner proper, which is made with double walls. The lower proper, which is made with double waits. The lower part is made content, so as to better distribute the mixture of gas and air. The burner proper is made from ordinary culluary utenalis, the inside part from a small pan, and the outside part is made from a columner with very small holes, the smaller the better These two parts are riveted together at the top, so as to make them tight. The lower or conical part-may be

times two facts are review organic that allow and may be fastened to the upper part as well as to the lower or gas pipe in made from ordinary black from and may be fastened to the upper part as well as to the lower or gas pipe in the same of the

number of holes at the top should be made for the

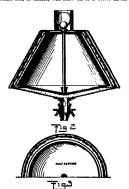
The cover may be cut out or perforated in such a to represent a landscape or any conventional The inside of the shield may be lined with design The inside of the shield may be lined with mics so as to render the heater more safe The mics may be tinted in almost any color desirable. Aniline colors are dissolved in amyl acetate, then mixed with amyl acetate colledion (commonly called banana oil). This mixture is applied with a soft brush and will It will withstand a great deal of



A GAS HEATER IN THE FORM OF A LAMP

heat. When the burner is lighted the gas will burn and form small blue beads on the outside of the por-forated burner, and as the flame strikes the asbestes fibers it will make them glow very brilliantly and change colors as the fibers are moved to and fro by the currents of air passing between the cover and the

If artistically made the heater may be used on the top of a table and will be a real ornament to the house but, of course, will show off to a better advan



SECTIONAL VIEWS SHOWING DETAIL OF CONSTRUCTION.

tage in a dark room. The outside cover is not at all necessary, but is only used to get the desired effect.

## FILES AND THEIR USES.

Nearly overyone who has had much filing to do, knows what a difficult thing it is to get hold of a reliable handle Wood ones will split even if ferruled, reliable handle Wood ones will split even if ferruled, or the brane ferrule will become hattered and weak-ened. Steel ones are rarely satisfactory, and the set stream are simply in the way. The following is a simple method of reinforcing the file handle: At the

end of the file handle turn two %-inch grooves, plac-ing them % inch apart. Connect by two diagonal grooves of the same size, wrap with a piece of paper,

growers of the same size, wrap with a piece of paper, and pour Babbit metal or solder in the top Trim up, and you have an everinating file handle A simple and inexpearate file cleaner is made by hammering either end of a medium or larro sized common wire nail until it is fait. This tapering flat piece is then trimmed off square, with a file, and lided to an even thin edger This cleaner is self adjusting to all files and is far more effective than the expensive wire brushes unasily used

the expensive wire brushes usually used.

Files as nearly everyone knows are made from the
best of tool steel to hold a sharp and strong edgeunder tremendous strain. This steel primarily has to
be capable of being easily worked and, after it is worked of holding the finest temper imaginable. It will be seen therefore that it must necessarily be the best of raw material for the articles enumerated below it must be remembered that files have a very high temper, and therefore in all operations in which this degree of hardness is not essential, the temper should be drawn by heating and cooling down slowly in order to render the steel less brittle in fact, the temper and quality of a good file are instanced by the fact that the writer has seen made and has tried satisfactorily a razor ground from a 10-inch flat mill file on a regular emery wheel and then honed and stropped into shape

Perhaps the first use I ever saw old files put to was a full set of nail sets made from 6-inch triangular files by snapping them off to an even length at five inches and grinding the points down to various sizes required The top ends were rounded of nicely, and the teeth were ground just enough to give a beautiful knurled effect to the set I asked the mechanic who made these tools why he hadn't used rat-tail files and make them round, but he said he just wanted them different from the common run of tools. Some years luter I did have the pleasure of seeing a beautiful set made from round files. Only with these there we left an unground strip between the two ends, to affor a good grip for the fingers

Another splendid set which was evolved out of



by a machinist who had occasion to do a little sure isl jettern making from time to time, was a complete set of little V-shaped gouges and flat chisels and half rounds, all made with curved shanks to reac wise inaccessible places. These were made by forging small files of the requisite cross section into the curve required, and grinding the shank and edge to the tool required, and grinding the shank and edge to the tool clearly dry requisite cross section 1 mean that he always took a flat file to make a flat chied and a wave process of the state of them by suddenly cooling in oil from a therry cell heat, and then tempered them to a medium straw and again cooled them, after which they were given their flant grinding and sharpeding. The tang on the file was just the thing to faster the flushed tool in a firmly ferrivaled handle, and the flow was compiled.

if you want a good heavy center punch, snap off either a rattail or triangular file of the right size to a convenient length, say five inches grind a good long taper on it up to the last % of an inch, and make the taper shorter to give more metal to the point, and there you are

there you are
Sometimes a file will help out a serious difficulty if
it is only used. An occasion arose in with it it was
absolutely necessary to absort of some large spikes in
some built up timbers that had sirrady been placed in
a building it to looked will night impossible unit
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the file several times before they were all cut Perhaps the most common use in which lay are put is to make them into burnishers for sharpening cabinet scraper and kindred tools For these they are simply mounted in a bandle and ground until they are perfectly smooth. Triangular files are the ones commonly used for this purpose. A round file makes as mellicular as lor any purpose A round file makes as mellicular as lor any purpose.

and with scarcely any trouble to transform it res for its new duties as it needs only to be sharpen An amateur desiring to take up brass craft work, and not wanting to pay the exorbitant price generally exacted for an outfit, decided to make one from flies In less than two hours he had made every tool lilu In less than two fours as man many every non-mor-trated in a large assortment, and they were a credit-able-looking outfit, comprehensive enough for any ordi-nary purpose, and included all the customary piercing, deating, tracing, and stippling tools.

## RECENTLY PATENTED INVESTIGES.

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for pacinging more or less finely divided meat-rials, its principal object being to provide such an apparatus in witch the operations of sem-ing an envelop or wrapper, supplying the con-tents, and closing and delivering the package are continuously and submatically carried out.

are continuously and automatically carried out.

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to insure accurate guiding of the fabric material with a view to locate the row or stitches
the desirted distance from the sign of the fabric
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stitches.

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mechanism to be operated.

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Kanasa City, Mo In carrying out this invention Mr Schunb provides a number of wheals,
upon the margin of which are extain figures
representing mout say values. These wheels
are operated by means of a series of rods or
planners and when so operated are turned to
than appearing in openings in the casing of the
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8.WMILL SET WORKS. R. JOHESON, Pet-leith Idaho. The object kere is to provide improvements whereby the operator is por-mitted to automatically control the head block knees wholl) independent of the main set-merhanism and with a view to move the head block knees toward nor from the new and to stop the knews accurately in the desired point.

localities CONTROLLING DEVICE—B V Issuisser, Alpena Mich. This lovention relates to pulp or paper machine, and the object is by per-vide a device for use in controlling the flow of pulp into the paper machine with a view to supply the latter with the proper amount of pulp for the correct working of the machine pulp for the correct working of the machine out danger of clogding. Show of the pulp with aut danger of clogding.

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Almost everybody knows something about railroad rules, but very few, unless holding or having held some railroad po sition, have a clear idea of just how many precautions are taken to prevent acc

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In addition to running by train orders
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hange from danger to clear At all stations a record is kept showing the departing time of every train at this station and at the next station east and west. Supposing a west-bound train to be west. Supposing a west-bound train to be approaching a station semaphore. The telegraph operator, if he has no orders on hand for this train to meet anything at his station, consults his block record, and if the block west is clear he calls up the station west, and obtains permission to let a train in the block lie then pulls his block signal clear and holds it in this position until the train is by, immedi ately reporting it to both block stations d the dispatcher

If a train from any cause has to stop between stations or finds itself on the schedule time of a superior train it has schedule time of a superior train it has to flag, putting down torpedors and send-ing a man with a red flag ahead and bark notwithatanding the knowledge that the telegraph operator will not let another train enter the block until it is clear Now, on double track things are very much simplified, as all trains going in one

much simplified, as all trains going in one direction move on the same track, and only have to take siding to allow a train of higher class to run ahead. This allows the use of automatic electric block signals placed at intervals of about a mile, all signals being on the right hand side of the track which they govern At every one of these signals the joints between the rails are insulated, thus cutting the the rails are insulated, thus cutting the tracks up into blocks between the signals. These signals are so wired that when a train approaches one of them, if the block ahead is clear, the circuit will be com ploted from one rail to the rail on oppo-site side of track through the wheels of the train, causing the signal to come clear, in which position it stands until the engine passes it—if one of these signals fails, the train is required to wait a min ute or two long enough to allow a pre-ceding train to clear the block or to fing, and then proceed with caution to the next

thousand times to one failure, and are so nal at the danger position

ane proper or determining the work ing capacity of the victim of an accident is divided into two parts. It is necessary to establish, first, the condition in which the accident has left the various organs and functions of the body, and secondly, the effects of the consequences of the accident was the effects of the consequences of the acri dent upon the power to work, either at pations as he may be able to carry on Dr imbert in a recent article criticises the methods generally employed for the solution of this problem. The attendant solution of this problem. The attendant only their personal opinions, instead of employing the exact methods of examina tion which are used in physiological laboratories. Thus in many cases, in which the statements of the victim appear false or exaggerated, the truth could easily be the electric exploration of the nerves and physiological study of certain occupa-tions. He thinks that it is possible to arrange a mass of useful data in a form in which they would be available for the decision of individual cases.

That apparently most remote of the sciences from the exactness of physical laws, economics, has been brought under the treatment of mathematics, not only by statistical methods, but by methods of the calculus. The distinguished mathematician and economist Cournet applied to the theory of wealth methods like those in mechanics to treat of equilibria, so that very complicated economic prin-



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Primare register U. F. Levreye, F. Panner, September 1, V. Levreye, G. State and S. Levreye, G. Le 90.1 945 904 239 American Homes and Gardens

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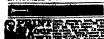
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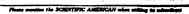
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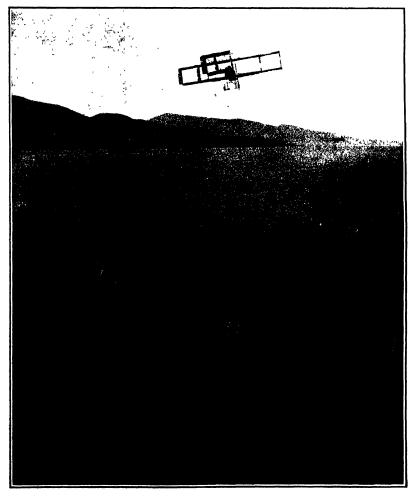






## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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## Scientific American

### SCIENTIFIC AMERICAN

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NEW YORK SATURDAY, APRIL 23rd, 1910

The Edit of is always glad to precive for examination illustrated articles exhibited of timely interest. If the photographs are sharp, the article attention of timely interest, and the photographs are sharp, the article attention of the photographs are sharp, the article attention of the photographs are sharp, the article attention of the photographs are sharp attention of the photographs are sharp attention of the photographs are sharp attention.

## TRUE WAY TO PREVENT BAILWAY ACCIDENTS.

i is well understood among railroad officials that the most fruitful cause of railroad accidents it this country is to be found in the lax sense of discipline among the employees Presumptive proof of this is found in the fact that, although our kading railroads have been equipped with a block signal system and other safety appliances, which are generally equal and in some cases superior to those generally equal and in some cases superior to those on European railroads, the number of accidents in proportion to the humber of people carried continues to be larger in this country. We therefore note with much satisfaction that the Chirago and Northwestern Railway has taken a step in the right direction by appointing an official whose chief duties will be to make a study of railway accidents, and by a system of education and strict enforcement of discipline, en deavor to eliminate the most fruitful cause of injuries to passengers and damages to freight Opportunity
was recently taken of the reorganization of the com panys claim department, to relieve the claim agent of much of the detail of his work and allow him to on much or one detail of his work and allow him to make a careful study of the causes of all accidents in the handling of passeogers and freight. It will be his duty to bring about a more thorough co-operation and a higher state of discipline among the various em-ployees, upon whose fulfillment of their duties the safe operation of the trains immediately depend scheme is a most excellent one, and we believe that its results will be so satisfactory as to lead to similar arrangements on at least the more important railroads of the country

## AN EPOCH-MAKING EXPERIMENT.

T the last meeting of the Institution of Naval Architects, a paper was read by the Hon C A Parsons which created a profound impr sion among the British naval architects and stin among the Brittsh hava arenteets and shipbuilders. It was described by Prof J A Ewing of Cambridge University as epoch making", and the announcements which it contained must be considered amouncements write it contained must be considered as second only in importance to those which were mude by Mr Parsons after the successful trial of his first turbine driven steamer. Turbinia .

Mr Parsons apaper which was entitled The Application of the Marine Steam Turbine and Mechanical (identify) to Marine Steam Turbine and Mechanical (identify) to Marine Steam Turbine and Mechanical steamers.

application of a combined steam turbine and reduction gent to a slow speed merchant steamer, the "Vespa-The Vespasian' is a small cargo st less than a thousand tone displacement, which in her original condition was driven by reciprocating engines which were sufficiently up-to-date to be considered as which were summinantly uptrocate to be considered as representative of the average engineersom equipment of the modern tramp steamer. To make certain that the comparison would be trustworthy, and equally favorable both to the reciprocating and the turbine curing the reciprocating engines were thoroughly exchanged and put in first-class condition. The ship overhoused and put in first-less condition. The ship was then taken to sea and put through a course of tricks in which complete data relating to draft weather water and coal consumption etc, were colletted. The vesse i was then returned to the yard the recuprocating engines were removed and a fast-run ning steam turbine with a 1 to 40 reduction goar was installed, the propeller used with the reciprocating engine being left untouched. The reduction goar conon on the high-pressure and low press turbing shafts and a large sour wheel on the propeller shaft The gears were of cast iron and the whole was mounted in plain bearings without the use of any special adjustment devices. The "Vespasian" was then taken to sea, and put through a similar course of

trials to those which were run with the reciprocating engines Except for the substitution of turbines for reciprocating engines, the ship with respect to dust, botlers, and propeller was in exactly the same condi

tion as in the first trials.

When the results came to be worked up, it was found that with seventy revolutions of the propthere was a net gain of from 15 to 16 per cent when steam for all purposes was considered, and of from 18

to 19 per cent for the propelling engines alone Translated into terms of boiler power, this means that one boiler out of every six in the slow cargo boat can be dispensed with

Bleaking of the important question of the strength

of the mechanical gearing Mr Parsons stated that as the 'Vespasian had been taken out in a heavy sea without experiencing any trouble with the red without experienting any trouble with the reduction goar, it was probable that the gear would stand any-bing that the shaft would stand in the discussion of the paper various shipbuilders referred to the long-standing prejudice against mechanical gearing, and it was the general opinion that its rapid wear was due was the general opinion that its rapid wear was due to the imperfections of manufacture which character ized machine work in the early days of the steamship, when goaring was used for speeding up the propeller just as to-day it is being used for speeding down the early mechanical gearing, moreover, because of its imperfection, was very noisy, but it was agreed that the almost perfect gear cutting which can be done to-day will practically eliminate the noise, particularly if the gear be suitably inclosed and sound-deadened

Westinghouse recently proved, in the remark able tests with a 6,000-horse power reduction gear which were carried out at the Pittsburg shops, that by the use of helical gearing, which is the type that was used on the 'Veapasian,' it is possible to transmit large horse-powers with an inappreciable amount of ear and with an efficiency of over 98 per cent, which is about the same efficiency as was secured by Mr

Now the vast importance of these 'Vespe will be appreciated, when we bear in mind that about two-thirds of the steam merchant marine of the world is of the slow cargo-carrying type, for which the steam turbine, because of its high speed of revolution, has been found to be unsuitable. Moreover, the 'Vespawas the first vessel to be fitted with the and it is reasonable to conclude that with its further application to cargo steamers, an average economy of at least 20 per cent will be guaranteed on the engine and 17 per cent on engine and auxiliaries, rof Ewing put it, there will be a saving of one

boiler in six on the whole equipment.
Furthermore, not only will there be economy at the coal pile but the reduction in weights will make possible a considerable increase in the cargo-carrying capacity in this connection, it should be noted that the United States Navy Department has authorized th installation of Westinghouse turbines with Melville and McAlpine gears in the new fleet collier No. 8, which is being built at Sparrows Point, Maryland The space and weight saved by the use of this apparatus as compared with the reciprocating engines originally contemplated for this vessel, will enable it to carry about 200 tons more coal, and it is belie that the economy in coal consumption will be such that the saving thereby effected will add another 200 tons to the net carrying capacity of the collier

### WATERWAY DEVELOPMENT IN RUROPE AND THE UNITED STATES,

E note that a contemporary sounds a word of warning against precipitate action in the wholesale development of the waterways of the United States, by drawing attention to a document issued by the British Roya attention to a document issued by the liftten Royal Commission on canals and waterways, which it con siders to be worthy of serious study on this side of the Atlantic The report deals with the waterways ct Beigium, France Germany, and Holland, and our contemporary advises that it be studied in connection with the recent report of the army engineers on the proposed 14-foot waterway from the Lakes to the Gulf It is claimed that the Royal Commission report strongly sustains the contention of the army engineers that the Mississippi and its tributaries, with 14 900 miles of navigable waters as developed and ed by the government, furnish as good an d waterway system as any in Europe

In France the waterways that are used considerably include a total of about 7,500 miles of rivers and canais, and of this 1,306 miles of rivers and 1,671 miles of canals have been deepened to a minimum depth of 6 6 and to a maximum depth of 8,5 feet, the bulk of the traffic being carried on water varying from 5 feet in depth down to 15 feet.

ermany there are 8,500 miles of wat depth of which in the rivers varies from 5 to 6 feet, while on the lower sections of the larger rivers the depth becomes from 8 to 10 feet. The depths of the alized rivers are from 2.6 to 75 feet, and of

most common Comparing these figures with those of the Minnishpp, we find that, even in the four-water season, boase of 55 to 30 feet farth may be sent from the Guil of Mentios 270 miles to New Orleans, Batton Grups, and Bayru Sara. Boats of 8-60s draft may travel 840 miles farther to Caire, those of 8-foot frant from the Sarah S tance of 365 miles to Chicago The Ohio has a depth of 9 feet from Cairo to Pittsburg, a distance of 1 000

Now, since the Mississippi and its tributaries a Now, since the Mississippi and its irributance soft-ially constitute a better waterway system than any in Europe, the question is asked, Wby is the river and canal tradic in Europe growing faster than the rult-road traffic, while in the United States rullroad tradic is rapidly increasing, and river and canal traffic fulling off One important reason is that both the musicipal and private interests in Europe have provided the waterways with good terminals, and boats and barges have been developed which are specially adapted to river and canal traffic. Here, practically nothing of the kind has been done

As an offset to these conditions, the advocates of larger waterway development are in favor of the construction of much deeper waterways than any Europe, deep enough to allow lake and ocean-go vessels to pass through When the government investi-gated this subject for the State of New York, the con-clusion was reached that the cost of transporting grain by the typical lake freighter on a deep-water canal would be 38 per cent greater than by a towboat and barges on a barge canal, and it was this conclu-sion that led the State of New York to abandon the idea of a 20-foot canal
Our contemporary is of the opinion that it would be

the very height of folly for the government of the United States, under present transportation and com-mercial conditions to spend hundreds of millions on the development of inland waterways believing that the only way by which considerable commerce could be diverted to the present or proposed waterways would be to compel the competing railroads to raise existing rates on low-grade commodities and refrain from making reductions. In France the govern ent compels the railways to keep their rates at i 20 per cent higher than the rates on the competing 29 per cent nigher than the rates on the competing waterways, this practice according to the report of the Royal Commission, being based on the opinion that waterways, because of the longer duration of transport, are not able to compete at equal rates with the railroads

## OSMOTIC PRESSURE AND CURRENTS.

is known that a current can be generated by forcing a liquid through a porous disphrasm or filter, but such currents were too small to be of practical value. The matter has been taken up by a German scientist B Schwerin He claims to have obtained remarkable results in current produchave obtained remarkable results in current produc-tion. A liquid circulates in a tube of large diameter and at a high pressure. Inside the tube is placed a filter through which the liquid passes, constituting of a certain thickness of a proses substance contained be-tween two sheets of wire gause. The current is faten from each of the absets by a wire. To produce a cor-rent we must have the proper liquid and the filter must be specially made. Adding suitable sails to water we find a bird value for the current. At the must be specially made. Adding suitable salts to water we find a high value for the current. At the water we find a high value for the current At the same time the daphragm must be made of matter in an impalpable powder to be effective, so as to reduce the size of the porce As an example he uses a pres-sure of 5 atmospheres for the liquid, and a layer of floody powdered carbon V, inch thick with a surface of 32 quare inches, the internal resistance beling 1000 ohns when datifiled water is used But a small current is now produced, but when we add ammonia to the water the current is increased ten times and the electromotive force twice, therefore we have 20 times the energy by using ammonia. The best results are given by fine quarts powder and the use of a much higher pressure At 80 atmospheres we have as high as 32 volts and 0 8 ampere, or 2,6 watts, which as nign as az voits and 0 5 ampers, or 1.6 watts, which is a very good result. The energy seems to vary as the square of the pressure, and at higher pressures we could obtain large currents. When the pores are finer the flow is issuessed, but the energy is about the same. The liquid is best sent in a closed circuit of relate.

## MALLEY'S COMET

HE first observations of the comet in the morn-ing sky show that it is disappointingly faint. Its intrinsic light has evidently not increased as rapidly as in the even of none other com-ets. Unless there is a change in this respect, it will be far from conspicuous to the saked eye until the lat-ter part of May, said those who wish to see it in the morning sky will do well to use field gissess, and to look for a much fainter object, with far less of a tall than our front sage Riestration of last week showed

## Scientific American

### engineering.

The Fennsylvania Railroad last wook operated the first electric train through the tunnels under Manhait an Island and the Sizet River The train, made up of stx construction cars and an electric locomotive, ran from the station in New York to the Thompson Avenue vidacti in Sunnyaide yard, Long island City

As important link in the proposed waterway from the Lakes to the Gulf must be eliminated from consideration of that scheme, at least for the present The section referred to is known as the Illinois River Deep Waterway, for which it was proposed that the State should appen \$30,000,000, in the extension of the Ohicago drainage cansi down the valley of the Illinois River The bills proposing to proceed with the construction were defeated in a special seasion of the Illinois Legislature, which adjurned bast month

nois Legislature, which adjourned last month. The city of Sentite is doing some exceptionally heavy grading in the reduction of the steeper little in that city. This grading, which has always been going as the present special control of the steeper little in the control of the steeper little in the control of the contro

The Greet Western Railway in England is installing a compact railway ticket printing machine When a ticket for a certain station is required, the clerk touches an indicator which carries the name of the station, slipe a blank into a slot, turns a handle, and the completed ticket drops out. At the same time a record of the sale is printed on a continuous strip of the proper, orgether with the fare and all information required, the same of the same time as the same of the same time as the same of the same and the same time as the same of the same time as the same of the same time as the same of the same time as t

It is well understood among naval men that the speed of a vessel is affected by the depth of the water not merely in shoal places, but in the deeper water ways. With a view to deturning what deet differ not depths of water have on speed, the Board of in spection and Survey has arranged that the standard different courses. The battlenthy "Michigan" and the destroyers "Reid" and "Flusser" will have their trials over three measured mile courses, one at Rockind over three measured mile courses, one at Rockind Mains, another at Cape Cod and the third in the

The Millet artivulated compound isomensive continues to grow in favor, the reports from incommittee of this type which have been seine time in service being in memer's very favorable. The New York Central system has recently put its first Mallet compound in service on the Boston A Albany line. The present class of heavy relight confine on that road has a maxinum tractive power of 28 tons, whereas the Millet, when working compound, has 33 tons, and when working simply 40 from tractive power. The success of this type in freight service is undisputed. What results it will give in fart passenger service time titled in the specific control of the service of the service of the service of the service of the title of the service of the service of the service of the service of this type in freight service is undisputed. What results it will give in fart passenger service time the first of the service of the service of the service of the service of the title of the service of the service of the service of the service of the title of the service of the s

Advises from Washington state that the chlef of the Bureau of Navigation of the Navy, the aid for operations, and the aid for personnel, are mapping on another extended cruise for the Atlantic Set At present the scheme proposes a naval review at Hampton Roads, followed by the departure of sixtons ships in four divisions for Olivaltar, where the divisions will asparate and visit the leading ports on the Modterranean. It is possible, though not decided, that the fleet will proceed theme through the Suce Canal to the Pallippiness and San Francisco, returning home by the Strate of Magelian. The fact will include the by the Strate of Magelian. The fact will include the "Michigan." and "South Carolline," and the "Now Hampshire" "Michigasippin," and 'disho,' seven of the Corollator hattichips, which were not present on the former order.

we indebted to Mr. Frank S. Taylor for the description of the nee dan with which it is proposed to the property of the propert

### ELECTRICITY.

Russia is becoming interested in hydroelectric power plants, and is examining into the matter of electrifying suburban divisions of its sizer railroads An investigation is being made of our high tonsion transmission systems, and it is probable that a new field will be opposed for American engineers

As alsocial lighting plant in Nobraska is manufacturing ion as a byproduct The exhaust steam of the plant, which would otherwise go to waste is utilized in the ammonia sheorytoin process of ice manufacture and also for distilling water from which the ice is made This venture, we are informed, has proved a very profitable one for the lighting company, and might be cycled to advantage by other plants similarly might be exploit to advantage by other plants similarly

A new system of treating eggs so as to prevent them from growing state when in cold storage has been discovered in Rochester This consists in subjecting the eggs to an electrical current. The theory is that eggs when piaced in storage are allve and are gradually freeze to death, whereas if the life is attrough by an electrical current before they are placed in storage they do not taste state, even when kept on ice for a long period of time

In an address recently made by Prof John W White head of Johns Hopkins Ultervetty it was pointed out that out of the 230,000 miles of railroad in this coun try, only a thousand miles have any rich seen else trified. He called attention to the fact that the elserification of the elserated railroads in New York resulted in in restaing the especiely of the reads fitty per cent. To be and freight service require; such substant, rich pan and freight service require; such per cent. To be Prof. Whilehead shows that in each case electrification to possible and often preferable.

Tangetse dissesses are commonly made by mitting the metal in a panel that is then extrained in the form of a financial after which the parts is expelled and the particles of metal are solved together by an electric current. This compilerated method of form tog the financial side to the fact that tungston is not sufficiently durifle to be drawn out into fine financial and English concern has just discovered a nucleoid of producing drawn filaments of tungston and the General Bieterit Company has also just amounted the discovery of a method by which tungston may be readered sufficiently durifle to praint of its being drawn into fine wires. The drawn tungston filaments at temper than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the filament made by the "shuff continued in the stronger than the shuff continued to the shuff continued in th

The Junior Wireless Club is making a strong press aming to restrict amainst work in wireless telegraphy Particularly oblectionable to them is the proposed annual fee of \$100, to be exacted from all wireless stations. As there are between \$4,000 and \$6,000 hope in the country with their own wireless equipment this virtually proposents a tax of between four and five million dollars. Of course, very few boys could be yet a \$100 fee, and the result would be that practically all amasteurs would be eliminated from wireless experimentation it does not seem as though this would be advisable, because many of the improvements in wireless telegraphy have been the work of months in wireless telegraphy have been the work of

Explosions are often caused in four mills and brevele by nails or other iron partities that find their way in the grain, and which when they atrike the steel rolls of the mills produce sparks and ignite the finely pulverized material about them. Revenity along mainting concern that had been troubled by many such explosions installed a set of electromagnets over which the grain is passed befrom 8-bing prepared for shipment to the brewerfee. All iron particles in the grain are thus picked up by the magnets and 800 to 1,000 bushels of grain are elemend per hour. When the magnets have collected a large amount of metal, and the grain are thus selected by the second of any particles afthering to them by residual magnetism. Since the installation of these magnets, there have been no explosions in the mills.

A series of tests was recently conducted for the Board of Zelicottlen of Newark to determine the best form of lighting for schoolrooms. The rooms in which the experiments were tried measured 33 yr 34 cell and were 12 feet high. Three systems were tried, consisting of testly two 15-candispower lamps, and fro-fe-antilepower graphitized filament lamps, and fro-ded tigs. The tungsten lamps were the most commical and gave by far the best light at each else, as was detarmined by illuminometer readings. A similar investigation has been made in Roston, where it are suggested that the room be lighted by lamps placed dampt the side valls just cander the celling in boose with prismatic gians bottoms, which would cast the rays into the room at the desired angle.

### SCIENCE

According to the Journal So. Chem, it has been shown that small quantities of blamuth exert little or no influence on the chemical relation of copper and nitric acid.

At a recent meeting of the Royal Society of Medicine in London, a warning was sounded against the revices use of radium. Even the reputed favorable effect of radium in the treatment of cancer were sharply criti-

The Seine is the fourth largest river in France ranking in size below the Loire, th. Rhone, and the Garonne Its drainage heatin (30,370 square miles) is larger than that of the Suzquehanna (27,400 square miles) or the Saramento (27,100 square miles) or of the Saramento (27,100 square miles).

Sir John Murray, K Cli the well known naturalist, will had an expedition for biological and physilogical exploration in the North Atlantic Although much has been done in this region an enormous field a still unexplored Sir John satiled from Pyrmouth on the 14th The nea will be explored to the depth of 1.800 feet.

B is said that Prof. Karl Harries of the Luivestily of kiel has produced a synthetic rubber. The actual details of the precess are not before us. Attempts and as these have been made gastin and again to the third with the commercial sucress. The most that can be said for them is that they indicate the possibility producing a synthetic rubber from turpentine at some future time.

Dr Robbing, an Emplish writer, calls attention to the development of the jaws of Profilm have who the British have been provided by the protinct british have been provided by the important notable improvement in them next to tust up refer stature and breatity appearance was the total change in the shape and expression of their faces. On analyzing this, one finds that it was to be made away to the provided by the increased growth and improved angle of the lower jaw. The change is due to the rations of hard task and 'soit junk' upon which the included substated

Sevents from all packs of the world will gather in Newdom CM in Art Anguel, and will ascered Mennat Wilson on International Mennat Wilson on Annuel on Innative Description of Mennation and Mennation and Serviced Institutions of tended by the Carnegh Solar Observatory to particle patts in the third regular convention of the International union for co-operation in solar rewards Annuag these will be Prof. Histon of Mount Prina the Annuag these will be Prof. Histon of Mount Prina the ward four disputes which of Mount Whismi are would four dispute a table of Mount of Mount of the Annual Committed the integret (discoper in the world four the study of the sun and by Augusta a new one will have been compiled of This will be a Ufonto tower telescope, which will have more than double the power of my other instrument of the Mind for photographing my other instrument of the Mind for photographing

Some years ago everal amplications of the born plane related diffraction gradings are activitied and ally their use with an opera gines for eclipse work he only discharding of these is the necessity of employing gines beneat for collimator and following which not only increase the xyne is the resider the instrument somewhat limited, in that the ultra violet region of the spectrum is more or less absorbed. Been experimentally by Mr. C. P. Builter have shown that comes replica agratings can be made to give very said softency results, and by slight modifications of the design of monitoring this form of spectrum one may spectra one of the property of the contraction of the side of the contraction of different dispersions and light granping power.

The orbits of the two luner satellite to Uranus were observations between the 1875. At that time no supractable eccentricity could be certainly proved to ratic in either orbit losten Bengatand, of the observation of the observation which have been made of these satellites since 1994 eithely with the great discussion of the observations which have been made of these satellites since 1994 eithely with the great control of the control of the second satellite Unlarded, large that the state of the satellites since the satellites shall be a fast tening of Uranus at the poles may be inferred, and the value of oblitaces approximately calculated Na Conclusive result in regard to the observation. Bengatant deduces from the observations, also, the values of the hand of the control of the sate of the plane of the sate of the sate of the plane of the sate of

### PROPELLER BRONZE THE EROSION OF

ONE EFFECT OF THE HIGH SPEED TURBINE

The introduction of high-speed turbine engines has produced a serious amount of crosion in propellers made of high tension bronzo—a material which until recently showed no serious erosion effects. The tr ble which the bronze manufacturer has been chiefly occupied in preventing was corrosion both chemical and galvante but crosion or the mechanical breaking and gavarant out crission or the increanited Dreating up of the material by the action of the water, was formerly in wer considered. One of the most nationals, cases of sower e-resident occurred in the case of the Cunard liner 'Mauretania', for after she had been in service about three months, on drydecking the ship it was found that all the bronne propellers. the ship it was found that all the bronse propelless were badly eaten away, those at the storn being best affected. The area that nuffered most was situated about two feet from the root and loward the after edge of the blade. The corrected area amounted to three or four square feet, and the metal had been ready away in depths which varied from a quarter of an inch to two and a half inches. A very therought examination of the problem was

made by Dr Oswald Silberrad who, after an exhaus-tive series of laboratory and other experiments, detertire series or intoratory and other experiments, determined that the deterioration was due to croston, and found that it could be prevented by the use of a special bronze siley whose chemical and physical properties were designed specially to meet the con-

dition
Dr Silberrad came to the conclusion that since the
material withstood the old conditions of propeller
service, the primary cause of the descriptancy as
due to the modified conditions of higher propeller
speed, etc. In discussing the new conditions because the
statement, first, to the terrife surface friction of the
water The "Mauretania" was originally fittor
the four three-bladed, built-up propellers, of the usual
high tension brones that has been employed form any
years for the propellers of Atlantic lines: They were
all title less than 17 feet in diameter, and your the a little less than 17 feet in diameter and pron the stward voyage the average revolutions of the en westward vorsee the sverage revolutions of the on spines were 118, the home-power developed being about \$2,000. The perimeter of each propoler traveled through the water in a helical peth at a garde of about 105 miles per hour, and framemitted to the water dur-ing the whole of the vorsee no isses than 17,000 home-power. "The consideration of these figures," says Dr Silbertrad, "monthless us to results (Ital, under such Silbertrad, "monthless us to results (Ital, under such conditions, the water becomes a very rough file for any alloy to withstand, and when the standard bronze, which has proved so serviceable in the past was sub-jected to these conditions, we can scarcely be surprised that it failed

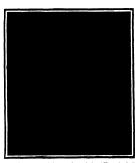
prised that it failed.

A curious feature in the problem was the wide and marked divergencies in the degree and position of the deterioration in the various propellers examined. Thus in the sister ship 'Lusitania,' where the condiraus in the sister sally Lissiania," where the condi-tions were at first apparently identical, the backs of the propellers were quite as much affected as the faces Moreover, the propellers of certain destroyers showed a maximum damage at the base (see illus-tration) where the helical velocity is issait. In look-ing for secondary causes, "dirt in the castings" was excluded because the eroded castings proved to be exceptionally free from dirt, "galvanic action" also was shut out by the fact that analysis showed that no large concentration of copper had occurred on the eroded surface. At the same time the areas of n mum deterioration do not coincide with the view that recusion is alone the primary cause, since these areas in no case occur at the extreme tips of the blades, where the helical velority is greatest.

After a prolonged research, involving the examina-tion of a large number of cases of propeller detario-

tion or a sarge number of cases of propeller determination, it was proved that the trouble was primarily erosion, although the degree to which secondary causes entered into the problem varied more widely then near which property. than was anticipated

a series of tests to determine the relative resis

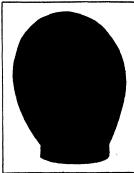


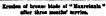
One of the new solid propellers of the "Mauretania" of special turbine alloy, which fall to show any erosion.

tance to createn of a large number of different alloys it was found that the number of hours necessary to produce a certain deterioration varied from 24.700 hours, the time of the regular standard bronne, to 117,200 hours for Parsons new turbing alloy, which was used to cast the new four-bladed, solid propellers with which the "Mauretania" and "Lusitania" have wine when the "Mauretania" and "Lustiania" have been equipped. An examination of these propellers, each of which weighs about twenty tons, was made after they had been running for nearly six months, by the surveyor for Gormanischer Lloyd, who reported that he found them in perfect condition. It is sigint, also, that since their adoption for th ward, or wing shafts each of these ships added about As the same four-bladed propellers are to be fitted to the other two antern shafts it is likely that the transmitantic speed may be raised this summer above the 20.06 average at which it now stands.

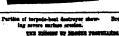
20 was in 1850 that Mr. Hind read a paper before the Royal Astronomical Bootet in which he trased this proportions of Robinson analysis of the State It was in 1850 that Mr. Hind read a paper before th account of another counts in 1264 was so contradictory that he had no hesitation whatever in preferring the Chinese statement for 1201, and concluded that the count of 1201 was Halley's. He believed that the precomer or 1891 was rightly. He officered that the pre-ording return of the comet was in 1233, when, in July, shortly before the death of Philip Augustus, a comet was seen for eight days in the evening twilight. The was seen for eight days in the evening twinger. The Chinese annals do not mention this comet, but they mention comets in the years 1223 and 1224, neither of which Hind thought closely resembled Halley's Comet, Cowell and Crommelin have shown that Hisd was Cowell and Crommellin days shows that was wrong about the particularly bright comet of 1223, which was unquestionably Halloy's Comet. Not all of Hind's "ascriptions," as art critics say, are reconcilable with Cowell and Crommelin's latest calculations. casers with Owen and Crommelin's agent chicul-tions, but enough is established on all hands to prove that Halley's Comet has been appearing over since the history of the skies has been written

A new type of locomotive designed to meture smoke less combustion of bituminous coal has recently been tried on two or three of the railways entering Chicago. tried on two or three of the railways entering Chicagon. The apparation is designed to operate or the colling principle. The coal is so fed as to admit of the gasse being first consumed, the resulting coke being figd to the grates and consumed without the black smoke of more rapid and incomplete combustion. Within the first-box is a magazine which may be changed in quastity, a ton at a time if desired, from which the coal is automatically fed to the first. A rotary has measured that the first-box forced on the coal is automatically fed to the first. A rotary has measured that the coal is automatically fed to the first. A rotary has made the coal in the coal is a community of the first that the coal is automatically fed to the first. A rotary has made the coarse of the coal in appears to be some skepticism whether the fir produced will be of sufficient intensity for loco









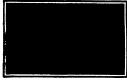


Brown propeller of a destroyer, showing promounted unidon, about the root notifies.

## HOT-AIR SHOWER BATHS FOR VETERINARY PURPOSES

BY DR. ALFRED GRADENWITZ

Receive betair fans have been employed for some time in medical practice, and have undergone during the last few pars most interesting alterations as re-gards form and use. In their original form they were used for drying hair by means of an air current pro-duced by an electric fan, and heated by an electrical



THE HOT-AIR VERTILATOR, A REALIS-WOODD REAC-TROMOTOR IN MINISTER IN THE HANDLE.

This current of heated air was soon found to possess striking curative effects. In connection with maladies such as gout the unatism neuralists atc a daily application lasting ten to fifteen minutes would allevi abe and in the case of prolonged treatment. and in the case of prolonged treatment even cure se silments. It is true that the limbs affected be-

cially susceptible to cold after the treatment e carefully protected by warm clothing had to be carefully prote

and to be carefully protected by warm doubling from time after the new treatment had been introduced in medicine before currents were found to are striking curative seffects on morbid tensure and in furnicularies abscesses of on account of the hypersemia (abundance or blood) produced by this Thus hot air shower bettin have been adopted in an activemely short time, not only in hospitals and sand toris but in the commitation rooms of specialities as well as those of the ordinary practitioner. There case of handling the readiness of the hot air fans from mothed with an ordinary contact box and the control of the heat effects at well by a special switch have greatly fastitized the adoption of the abover battle in fact the tar ventilators are sub to generate to half in fact hot air ventilators are able to generate in half a minute a strong air current up to 212 degrees F a result impossible with any other apparatus

The electrometrical instrument factory of Dr Rich

and Heibrum in Berlin has recently extended the use of hotels shower baths to veterinary practice. The ventilator used in this connection comprises a series wound electromotor bidden in the handle of the apparatus. The electrical radiator heating the drawn in paratus The electrical Robator heating the drawn in air current to a temperature up to 212 degrees is other-ried by a connection tube 40 millimeters in diameter. The weight of the apparatus is about 2 pounds the current consumption of the motor under a tension of 220 voits is 0.2 ampere and that of the radiator a amperes A mickel frame! 00 millimeters in length

and 30 millimeters in diameter fitted over the mouth piece allows a hot air current of increased intensity to be generated which is particularly valuable in con-nection with a localized treatment

As does and horses are especially suprentitle to



THE HOT-AIR SHOWER BATH AS OPERATED IN LOCALISED TREATMENT

catching cold the hot air shower bath affords an effective means of alleviating and curing their atiments even the most nervous dogs becoming astor istimed to

## THE MICROSCOPE AS FOOD DETECTIVE

BY P. HARVEY MIDDLETON

Probably no other form of wrongdoing so vitally af fects us as tampering with our foods and medicines of course the law allows the presence of a certain per centage of preservatives in foods but it is the excess contage of preservatives in foods but it is the excess of this allowance that causes a continuous war to be waged between the traders and the representatives of the law And so profitable a proceeding is the importation of inferior material into the food of the American public that many large firms employ skilled chemists at a high salary in order that their expert knowledge may assist them to drive a coach and four

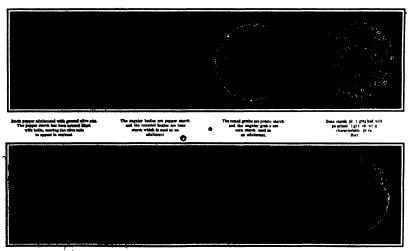
through that most far reaching and radical law of modern times the Food and Drugs Act of June 10th 1906 and fatten on the proceeds

In what a remarkable manner our food is tampered

in what a remarkable manner out food is tampered with may be gleaned from the fact that a large and highly trained staff of inspectors and their assistants are engaged under the lood and livings A t to det el offenses of this kind and great at the difficulti s are engaged under the sood and Drings A t to set or offenses of this kind and guat at the difficult is with which they have to contend. For instance it is a chemical task to prove that poison us copy or salts are applied to bottled vegetables to give them color and a

microscopic achievement to show that a concection lab l d and so the dus acrowroot is no bing of the kind lab I d tud as tid due atrowroot is no hin, of the kind but chieft potato starth. It is difficult to prove who juts brick dust peroxide of from or arrowroot in a larmics looking packet of cooks or which hand to trid es substances levis d tim coal tar into wines, syrups and in go to mak this more attractive to the Onc sul it | nily is t violet olering matter beasts a name i fifty fiv letters with a le die-thyldibenryldiethy triamidotriphenyleni in idisulf me

The alleged olive oil used in salads is oft a cotton



are this transported of ours starch (angular Pellon from honey The various forms hoping and goes transported forms and indicate the different plants visited. THE RESIDENCE AS FOOD DETROTIVE.

seed oil, and such substances as burnt sugar Cayenn pepper, accile either, taunin, crude cream of tartar,

nd French plum juice are frequently imported into brandy and whisky

The term 'adulteration' when applied to food or drugs is broad in its scope, but has been given a defined legal meaning. In general it may be said that adulteration consists in injuriously subtracting from a substance any part of its natural or inherent quality or adding to it any ingredient which would render article of a different nature than that of its express nd natural form

Almost coexistent with the growth of this wonder Almost coexisten with the greats of this wonder-ful country, and seemingly as a part of the fierce bust ness competition which has insidiously developed, this evil of food and drug adultoration has arisen. The conditions of substitution and adulteration of foods and drugs were little short of deplorable less than a dicade ago For seventeen long years the bill which has now become the Pure Food Law lay at the door of than now become the Ture root law my at the door or Congress and during all that time it was bitterly op-posed by the manufacturers who had so long enloyed unmotested their privilege of supplying the dinner tables of the nation with impure foods misleadingly

While this act has done much good, there is still a very considerable amount of adulteration practised Pepper adulteration is still remarkably common and "Pure White Clover Honey is concocted by the imitators of the busy bee from gluose Other enterpris rations of the ones peer from guttone Other enterpris-ting manufacturers will cause two grains of Cayenne pepper to grow where only one grew before by making one of the grains grow out of sawdust Ground peas and beans may be found in black proper, and colory seed may be adulterated with forty per cent of pow

In order to run down one class of feed faking, the In order to run down one class of feed faking, the pure-food experts at Washington have introduced the raicroscope into their work. It can be readily under stood how gross adulteration may be detected by a sim-ple microscope, as for instance when for ign seeds gravel, or powdered rock have been mixed with whole es. The adulterant may be of such a char acter as to escape the notice of the ordinary buyer though with even a small lens or reading glass the for eign substance may be seen to be very different from

ilness of the simple magnific food and drug materials, however is of little value for the examination of products which are made up of small particles such as flour, ground spices and pow dered drugs In such cases recourse must be had to the compound microscope with a magnifying power ranging from fifty to four hundred diameters

The world's supply of stark comes for the most part from a limited number of plants, twelve or fifteen early all that are of much commercial im To the naked cyc these starches all appear as a fine white powder, but under a microscope grains or granules are seen which vary more or less in shape, size rings nucleus and action toward polarized light Bome of the grains are almost spherical, others are old and still others are very irregular in in diameter they vary from one-tenth to one-bith of a millimeter. In no variety are all the starch grains of one size, but usually there are fairly well-defined limits. The way in which they sometimes vary will be seen by reference to the photographs re-produced in this article. Most of the grains show, more or less clearly fine lines of rings upon the surface. In some varieties these are arran

"A hilum (nucleus) whose form and position varies widely in certain species commonly occurs in starches," says B J lioward, who has charge of this microscopi work in the Bureau of Chemistry at Washingto "In some it is at the center as in corn and wheat starches, in others near one end, as in potato and ar-rowrout When viewed in polarized light starches show more or less strongly a cross with the bars pass-ing through the hilum. Wheat starch has a central ing through the hilum. Wheat starch has a central cross while in maranta it is occurric and well defined Bean starch which illustrates the leguminous type, has a spindle-shaped cross. In the oat a number of starch granules are joined together forming a mass when these masses of starth are examined under po-larized light individual grains in the mass have their own individual effect, and interfere so with each other that there results little more than a hazy glow of

By becoming familiar with these characteristics it is possible to identify with considerable accuracy nearly all of the commercial starches. Potato starch adulterated with corn starch wheat with corn flour, and buckwhoat with wheat are examples of those most easily detected. One of our photographs shows a picture of points starch adulterated with a consider-able amount of corn starch. The grains of the latter are easily distinguished by their angular form

are easily distinguished by their angular torm.

Another interesting application of the microscopic
method of food analysis is found in the examination
of spices. Many of these naturally vary so widely as
to ash, fiber, etc., and in taste that it is impossible to

## Scientific American

identify certain kinds of adulteration by chemical and identify certain arose or souteration by chemical and physical means alone. A study of the structure of pure samples will usually fit the analyst to detact adultera-tion in the ground spices as well as to identify the adulterant used in order to work most intelligently, however it is importative that the analyst should have however it is imperative that the analyst should have a good foundation in histological botany, since in this class of products the plant cell in its various modifica-tions becomes the means of identification. In an exam-ination of this sort nearly all kinds of plant tissue are mation or this sort nearly all kinds of plant times are to be considered, because some spices are derived from roots, as ginger, some from barks, as cassis and cinna-mon, some from flowers, as cloves, some from seeds, as mustard, some from fruits, as red peoper, black peop-per, etc., and some, such as sago and thyme, from

"Unfortunately," says Mr Howard, "most of the substitutions used for adulteration have a structure very different from the genuine spices For example, ugh pepper may be adulterated with ground peas or beans, it may not always be detected by che means, especially when olive pits or pepper shells have been added to counteract excessive starch present in beans. A microscopical examination will reveal ich adulteration at once by showing the p the large starch grains characteristic of certain legumes. In pepper the starch is present in angular masses made up of small grains."

It sometimes occurs that a manufacturer has added so large an amount of corn meal or foreign grou shells and fruit atones to a pepper as to make the adultaration apparent to the taste by the lack of pungeary, which is often corrected by adding a small amount of Cayenne pepper A sophistication of this kind can be readily detected by the microscopic method kind can be readily addrected by the microscopic method of analysis, because the tissues added are so distinctly different from normal pepper tissue. In one of our photographs is shown the microscopic appearance of a sample of pepper which was grossly adulterated with ground citive stones. The starchy material has been stained black in the picture, while the partly clear por tions, more or less oblong in form, are the stone cells of the olive pits

The capsicum fruits are readily identified by mes of certain cells found on the inner portion of the peri-carp (pod) and others on the seed coats. These cells have characteristic sinuous outlines which make them to detect even when present in very numbers.

In coffee and chocolate preparations roasted chicory cereals, and peas in the case of the former and starchy materials and cocoa shells in the case of the latter, are sometimes used for adulteration Coffee, being are sometimes used for adulteration Coffee, being the seed of a plant has a structure which is very dif-ferent from chlory, which has not. The cell walls of coffee have a characteristic boaded appearance which has present in but few other seeds. Even after roasting and grinding these beads can be easily distinguished while oblerary constains. while chicary contains can vessels by which it can be

cocoa plant, to which foreign starches are sometimes added. Cocoa beans content amount of starch The grains are small in size and are easily distinguished from the starchy adulterants, such as corn and wheat flours or potato corn, and ar rowroot starches. An artificial chocolate coating has

rowroot starches An artificial checolate coatting has been examined which was composed of cooca shells, corn starch, beef tailow and some mineral matter, probably used as a coloring substance.

In the production of artificial julies jams, and some kinds of confections various thickeners are used among which might be mentioned gelatin, starch, agaragar gum tragacanth, and gum arabic. Some of these are difficult of identification, while others can readily detected. Agar-agar is a product made from cer tain seaweeds, and usually contains the siliceous shells tain seaveds, and usually contains the silicrous shelin of ristams. These shells are characteristic and quite distance the shell are characteristic and quite after the tail of the shell o

Starrh can easily be detected by microchemical and microscopical tests. Gum tragacanth and some other gums of this class contain a certain amount of small starch grains. When allowed to swell in water, a delicate laminated structure is developed by which these gums are disclosed even in such products as ice cream and marmalades.

A sample of thickener for cream composed of corn starch and powdered gum tragacanth is shown herein, and illustrates this feature quite satisfactorily In this case the corn starch is shown plainly as the angular particles, while the stringed bodies near the center of particles, while the striated bodies near the center of the field are sweller regression of the gum. The microscope is also of service in the examination of certain odible fats. Thus, if pure land is dissolved in other and the latter is allowed to evaporate slowly under proper conditions, crystals of the land will be foresed. These, if normal, will appear under the microscope as narrow plates with chiled-langued engla. Best latt

treated in a similar measurer will normally orystalties out in sheaf-like turus of crystals, the ends of which

Arms at 1970.

Another app cation of microscopic analysis is in the Absolute application or microscopic inturings in mid-dientification of the flower from which honey is made. This is of practical value in the analysis of honeys purporting to be from certain flowers. Although bees will almost invariably gather honey from several kinds of flowers, sometimes one or another of these predom-nate to such an extent as to impart a distinctive color and taste, enough to allow the honey to be called by that name By microscopic examination it is readily and taste, enough to allow the honey to existe my that name By microscopic examination it is readily assortained whether a so-called apple-blossom honey or an orange-blossom honey is really largely derived from the source claimed A photograph showing sereral kinds of pollen found in an ordinary sample of ney is reproduced

### Correspondence.

### THE INVENTION OF THE PLAYER-PLANO. To the Editor of the SCIENTIFIC AMERICAN

must file a demurrer to an impression the illustrated article which appeared in your issue of the 9th inst., under the heading "Ringing Chimes by Perforated Music Sheeta." In referring to John McTammany as one of the inventors of the player piano, I think an erroneous impression is thu veyed regarding McTammany's true relation to the development of the player As a matter of fact, he is known and conceded to be

As a matter of fact, no is known and concesses we the father of the player by everyone in the plann trade familiar with the player history, and his claims to its inventor-ship stand unchallenged up to this moment. We do not refer to McCormick as one of the inventors of the reaper or to Howe as one of the inventors of the sewing machine nor to Cristofori as one of the inventors of the plane, although other men besides those mentioned contributed greatly to the development and improvement of the aforesaid inventions.

The history of every great invention has demon-strated that some one man has stood out pre-eminently from all his fellows in the course of its development, and the player has been no exception, and the one man who above all others stands forth pre-eminent in the player field is John McTammany, while around and about him, like so many satellites, have stood other men who have contributed of their genius to develop and improve the invention. In the case of the reaper was McCormick who overshadowed all his co it was McCormick who overshadowed all his contem poraries, on the other hand Howe was the presiding genius who led the sawing-machine piencers, while Cristofori was the pre-eminent genius who first con ceived and developed the plano

It is true that others have improved upon the hand work of McCormick and Howe as well as upon that of Cristofori, but nobody has been able to eliminate the elements which they introduced into their respective inventions, and so long as those essential elements remain in their respective devices, just so long those inventions shall be attributed to the men we have mentioned But the plane invented by Cristofori was a mute and silent piano, and such it remained from the time it was invented, in 1709, until 1876, when John McTammany breathed within its wooden walls John McTammany breatned within its wooden wain-the breath of life, and henceforth it became a living, breathing, yea, aimost a human thing, until to-day it stands forth the unsurpassed and unchallenged king of musical instruments. The following definition of the player has been accepted by the plane trade as

authoritative
Flayer, a mulcal instrument consisting of a easing two
Flayer, a mulcal instrument consisting of a easing two
one of said serious adapted to be operated manually, the
other designed to be operated manually and the operation of a perterned abset on rolls, a wind, sprine, or other motor for
other designed to be operated manually by means of a perterned abset on rolls, a wind, sprine, or other motor for
other parts of the part of the serious of the serious part of the
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experiments. "The serious and varying the
experiments." The serious and the serious and

Now the first man to embody the forespoing elements in a musical instrument was John McTammany, and it follows that, if McCornick is the investor of the reaper, Howe of the sewing machine, and Cristofori of the pitan, by reason of the fact that they were the first to embody in their respective devices the essential elements which distinguished those inventions toward and the infinitation of which would make them worthless, then by the same token John McTammany must be reparted in a the faller of the pitanoplayer must be reparted in the faller of the pitanoplayer put been made that (48 not contain the elements fore embodied by him is a practical working intergrees. Now the first man to embody the foregoing elemen embodied by him in a practical working instrument as early as 1876, and which was publicly exhibited in as early as late, and which was popicly extinction in St. Louis the same year and described by the press of the country at the time, while your own files will show that Muna 2 Co applied for a packet on this identical investion on behalf of McTammany on Sep-tember 7th of the same year, and prior to that nothing in the nature of the present player was known to the tember 7th of the manor in the nature of the present player was known to make the present player was known to make the public, either of this country or Welliam N. Trask, W. Trask, Todonicy,

## THE SOLAR AND LUNAR ECLIPSES IN MAY, 1910

BY FREDERIC R. HONEY, TRINITY COLLEGE

An examination of some of the conditions which govern the moon's motion reveals the great complex-ity of the least problem. While the earth's volume is nearly fifty times the moon's volume, its weight is more than eighty times—the density of the moon being only six-tenths that of the earth.

As a consequence, the common center of grav-ity of the two bodies is within the earth at a distance of over a thousand miles from its sur-face, and it is this point which moves in an elliptic orbit around the sun. Twice each month the earth and the moon exchange places with reference to the sun The moon's orbit is an ellipse with the earth at one focus, and the plane of the orbit is inclined at an angle of a little over five degrees to the ecliptic. The ec-centricity is one-eighteenth, but the elliptic form is subject to great variations. The moon re-volves around the earth at an average velocity of a little over five-eighths of a mile a second, but its path in space is the resultant of its motion in its orbit and

of the earth's motion at a velocity of eighteen and five-tenths miles a second, illustrated at Fig 1 The arrows A and a represent the velocities of the earth and the moon in their respective orbits. When the moon is at M, between the earth and the sun, the direction of the moon's motion is opposite that of the earth At M' the earth and the d a represent the velocities moon are moving in the same di rection. At these points and at any intermediate point H" or H" the moon's path is the resultant of the two metions. The plane of the moon's orbit rotates slowly in a direction contrary to her orbital motion, and the perige a slow motion in the same direction as that of the moon

While the conditions which dotermine the moon's path plex, observations extending over plex, observations extending over long periods of time show regu-larity in the recurrence of eclipses. (See Scrytter Americ Can, September 12th, 1908) The direction of the line of nodes is shown in the plot of the earth's orbit for November 1909 at the te of the last lunar et lipse, s also in the plot for May, 1910 During the interval this line ro tates through an angle of over nine If the positions of the earth at the dates of the solar

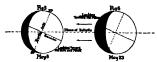
and lunar or linees in May be carefully plotted, and the on's orbit magnified, the situation of the moon relative to the ecliptic may be determined by an inspetion of the plot The arrow A shows the direction of rotation of the orbit, and a that of the moon's

At the date of the solar eclipse (May 8 7 d ) the m orbit radius is projected on the plane of the ecliptic in the earth's orbit radius, and the moon's position in the earth's orpir featur, and the moons position is in that part of the orbit which is below the cellptic. This is shown more clearly in Fig. 2, in which the orbit is magnified one hundred and sixty times. The moon's position is shown at Greenwich noon from May let to the 28th, and also at the dates of the May let to the 28th, and also at the caree of the coclipses On May 87 d, the date of the total occlipse of the sun, the moon will be inserve perigse, and approaching the ascending node N which will be reached between the 10th and the 10th. The enlarged plot shows clearly that the moon will be below the ecliptic Its shadow will therefore be projected on the south-ern hemisphere. The path of totality will be between was inestupies: The next of totality will be between fulfilling the and 70 degrees south, and as a partial eclipse it will be visible in Australia, New Grinnes Januaria, and Java. On May 23 74 d he mone will be below the ecliptic, and will pass the descending node N' on the same day The beginning of the eclipse will be visible in portions of Africa, southwest Europe, North America accept. Alaka, Santh America, and the southern Pacific Ocean, the ending visible in South America, North America accepting Alakas, and the central and southern Pacific Ocean.

In Figs. 2 and 4 a portion of the earthy orbit in the particular of the control of the cont

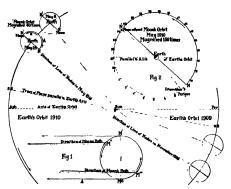
shows how points on the curve are obtained between the dates May 8th and 11th, Greenwich noon. To poster exhit radius is drawn parallel to the poster

for each date in Fig. 2, and the curve is traced through the positions of the moon. The orbit of the moon at the date of the solar occlipse is also shown in the



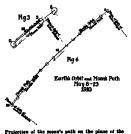
The earth during the May eclip

curve of the moons path (Fig 4) there is no point of inflection, that is, it is always concave toward the an. The earth moves about three and one-third times to diameter of the moon's orbit each day Figs. 5 and 6 are projections of the earth on a plane



Velocities and motions of earth and m of earth and moon in their respective or shows the moon's orbit highly magnified

which is parallel to its axis, and perpendicular to the plane of the ecliptic orliptic In these projections between the ox and the summer solution, more than one-half of the visible surface is illuminated



THE SOLAR AND LUNAR ROLLPRES IN MAY, 1910

arrows show the directions in which the eclipses will

The Fast Hall of the Future.

The principle of a mechanical delivery of mail has on established by the highly successful use of the pneumatic tube. This device is not the least conspicu cities, and probably will be applied to a greatly ramified postal enterprise in the near future. The chief question that arises in consequence is whether a system of delivery similar to that of the pneumatic tube can be installed for greater distances and at the same time afford an enlarged rate of

speed At the present day pneumatic postal de-livery is found only in the large cities, and be-ing restricted to local business, asks a rather exorbitant price for such service. It is plain that the employment of such a mode of distrithat the employment of such a mode of distri-bution to distant points consequently among the cities also must give a wholly new aspect to the present systems of commercial inter-course The first attempts made for the devel-opment of this lifes were those of a company formed in Paris. A recent number of Der Electrotechnische Anzeiger states minutely the techni-

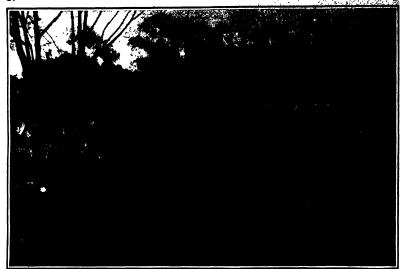
cal formation and other progress of this enterprise which has reached the singe of thorough practicality, the result of the quite facile function of the experi-

For the near future the Paris pany intends to connect the larger cities of France through electric postal routes that shall not have frequent intermediate stations. The rate of speed pro-posed is 250 km (155 miles) an hour. The capacity of the autohour The capacity of the auto matic express car is to be 2 cu ni (26 cu yds) approximately and the weight of a load consist ing of letters and other postal pleces of smaller dimensions shall not exceed 100 pounds

The roadied so to speak, on which such delivery shall be practisea must of course, be separ ated definitely from all other avenus of physical communication must be inaccessible to the oured only either through an elevated road or through a tunnel for their experimental road the company has chosen the latter device and has built a tunnel which contains two rails, one above the other and of which the (ross-section measures 8 sq m (5; sq yds.) For the round trip beginning at intermediate stations branches and switches are provided. The function of the experimental road, procured through an electric circuit, in such that the highest speed is The cars have two wheels which

reached very quickly run on the lower rail and also two rollers which fol low 'be upper rail and bold the cars in position The curs, moreover have a middle compartment for mail, and other divisions for the motors and the devices used as brakes. In front and behind the body of the cars is a conical point to diminish the resistance of this air. The frame of the cars is of iron exclustvely The motors are attached to the frame by means of levers which swing around an axis perpendicular to the direction of travel. The current is applied through an upper conduit and the brakes are worked through an upper conduct and the branch are so shows by compressed air as will as by the resistance of the air artificially increased by the wines attached to the sides of the front end of the cars. These wines stretch out to catch the air. This device can stop a car within one minute and in a distance of three kilometers after the current is interrupted but is used only as an acprevent the too rapid destruction of wheels and rails through the exclusive use of the rail brake, ce of most active friction

A patent recently granted to Carl Farkas of New York, describes a method for making invandescent lamp metallic filaments which consists in producing on a conducting core a highly refractory coating by on a conducting core a highly retractory coaling by decomposing in a vacuum the vapors of a salt of a highly refractory metal in the presence of vapors of pryagali, with final reduction in a vapor of hydrogen in detail, the vapors of chierde of chromium and pyro-gall are introduced in a vacuum containing the con-ductor, which serves as a core, which latter is then bested by the passage of a current, the vapors are heated by the passage of a current the vapors are thereby decomposed, nascent carbon from the pyrogali acting as a cement chromium probably being formed When the conting has thus been produced the vapors are removed and hydrogen gas introduced, whereby the deposition is reduced to metal



Some of the little craft that competed in the racing.

## MODEL MOTOR-BOAT RACING

BY H. D. JONES

Model motor-boat racing, a new sport, has caught the popular fancy in England, and is being taken up in all the inrge cities. With a view to encouraging owners of models to enter their boats in the various competitions, challenge cups are offered by the clubs, and the conditions are made so broad that every de-signer feels that there is a chance to win a trophy signer recision that there is a chance to win a trophy. The prizes are awarded for speed, for ownermanishly, for the general appearance of the models, for the behavior of the machinery and the performance of the beats white on the water.

Not less than 5,000 spectators gathered recently at

m Common, one of the many open spaces in South London, to witness the regatts on the lake The competition brought to the front some of the speediest racing models, some particularly fine ones of saloon steamers, liners, and torpedo boats, and other eraft that were built for appearance rather than for racing

The rules of racing were very simple started his model boat to run a straight line over the course at the end of which officials appointed for the purpose withed to "catch" the racers and return them to their owners. After the models were once started no interference was permitted, the sbillity of the unguited boat to keep in a like for the finish of the course being part of the qualifications for prize win

hing Over a course measuring fifty-one yards, four bosts were started in the first race, at which the accompanying prictures were taken. The best time was made by a steam hydroplane, the "Folly" in 9 15 econols, "Sunny Jim' a gasoline eraft, did the distance in 12 % seconds, "Mounty Jim' a gasoline eraft, did the distance in 12 % seconds, "Audia IV", a seasure, covered in 11 % 15 % seconds, and the fourth steamer, "Jdunno." In 21 seconds

in 21 seconds
On running off the final heat, boat against boat in
ourse the 'Sunny Jim' scored three wins, the "Leda
'U vac who and the "Iduning" one win thus taking
first second and third prizes in the order named
The prizes we subver uge The "Felly." the fastest
boat in the (limitaring trials, unfortunately ran off
off or course in the finals through the propeller fouling,
and out being able to get going in the others, she had
to give har Opposites a walk-over.

to give her opponents a walk-over Steering troubles were responsible for many awk-ward results in the other races. While halled by the sweetstors as adding greatly to the enjoyment of the regatta, the failure of the little craft to keep their pointing and the perversity of the machinery when

left to its own resources proved sources of great disset to us own resources prove sources or great cap-appointment to the owners of models that failed to keep a true headway. Boats that had run as true as a die on practice spins exhibited a tendency at the regatta to run anything but straight, or not to run at all Casoline motors refused to start, pumps gave out, boilers leaked and the models exhibited a cranki ness that showed there is a lot of improvement necessary before this sport can be brought to perfection. But that is why the regultas are encouraged. The weak points of the models are strengthened, and motor-boat building is benefited as the result of the mons learned from the eccentric performances of the models in the cup races,

The reliability of electric power in model regattas was demonstrated again and again, one finely-modeled liner, the "Fairholme," although not built for speed, scoring through the certainty of her performance and the untrustworthiness of some of her competitors.

The surprise of the meeting was the performance of a finely modeled gasoline boat, the "Silver Dart" So fast was this entry, that the officials stationed to catch the models at the posts could not reach her when a little off the line, and she sworved away Heading off down the pond, the little boat cluded a second attempt at seizure, and before she finally came to hand she had completed two round trips in brilliant if some what erratic fashion, to the admiration of the sp

tators tators. The expediency of running the regatins on a tirechar instead of a straight course is also emparing the large of the course of the cour The expediency of running the re-

parison with the work of other designers, a number of men with kindred ambitions are brought together in these challenge meetings, and the test of the new at a capabilities is thoroug

The sport has progressed so far that a national challenge cup is ready for the competing designers and model owners of the United Kingdom, and the various clubs are about to hold a general meeting to draw up rules for the government of the cup regattas Naval men are especially interested in the exhibitions. At the regatta, which was the subject of the accompanying pictures, Lieutenant William Barrett, R.M. attended with a party of naval cadeth and rendered national with a party of naval cadets and rendered many services to the committee

at of \$0,000 Candle-Power Street Lighting Plant.

BY ALTON P ADAM

As tungsten lamps require only 36 per cent as much energy as the carbon type for equal illumination, they have greatly reduced the cost per candle-power of in-

candescent streyt lighting.

What can b. done with such lighting in a small town is illustrated by the following costs and operating expenses for a plant to generate and distributing standard street lamps of 20,000 candie-power total.

Unlike the merely nominal rating of are lamps, which are a number of times their true candle-power. the tungsten lamps are rated at their actual mean can-dio-power in hecisontal directions.

The capacity of 20,000 candio-power is selected as

The capacity of \$0,000 candle-power is selected as nearly satisf for stress lighting in many medium and small tewns, according to the density of illumination required. It lamps of 40 candle-power are selected the capacity named amounts to 560, and with lamps of 30 candle-power the 38,000 sandle-power capacity will operate 180, the efficiency being the same in either

With 500 of the 40-and/s lamps spaced 100 fact parts, or 550 of the 80-and/s lamps and 600 ets app. 500 of the 50-000 feet in length of streets may be lighted such about the min light of streets may be lighted such about the same places, while ordinary remains may be obtained by specials deep feet parts 100,000 feet, or 18 mines, or streets. In the full wing estimates or the first costs and operating exposens of a 50,000 eanding-power plant, if it may be such as the full parts of the series and the series of the point of the exposure of the full parts of the series and the series of the point, for mach may be the series and the series of the point of the series and the ser With 500 of the 49-candle lamps spaced 100 fe

PL to downe

significant.

The artimate of first cost covers a suitable plot of isset, a station building of brick, concrete and steel, a pterage tank to receive pietroleum by the carind, a crude-oil engine and accessories, an electric generator trade-oil engine and accessories, an electric generator with all necessary apparetus and instruments, pole lims on 50 000 feet of streets, circuits on these poles

is usual in the cost, en helf of the United Stat

the lamps burn yearly

increase of cost would result

Operating expenses of the above plant will vary

with the number of lamps used even though the total candle power remains at 20000 because of the

cost of lamp renewals and also with the hours that

All night and every night lighting to the extent of 4 000 hours per year is the most desirable and costs

4000 hours per year is the most desirable and costs else per hour than lighting on moon and other sched nies that run down as low as 1500 hours yearly such all might and very sight lighting its gradually displating the short hour scrive and the following certaints of operating expanses is for lamps burning 4000 hours per annum With 500 drives lumps of 0 candle week making up the total 3000 candle one of the cost of the cos

power capacity of the above plant and burning 4 000

200 including \$710 for interest on the first cost of \$14.400 at 5 per cent. This expense of \$6.200 covers all depreciation of the plant as well as the operating

serpense that involve an immediate outlay of cash Apart from the interest charge 'he annual expense of operating the 500 lamps of 40 candle-power each during 4000 hours yearly in thus \$5.480 The total expense of \$6.200, including interest amounts to \$13.40

the annual expense of operation

justry for each of the 40-candle lamps burned 4 000 hours, or to 6 31 cent per lamp hour of burning. As each 46-candle tungstan lamp operates with 50 watts, the expense of 0 31 cent per lamp hour, including interest, amounts to 6 3 cents per Allowatt hour con

interest, amounts to a second por sumed in the lamp The same conclusion is reached by considering that at the efficiency of 126 watts per candle-power the production of 20,000 candle-power requires the delivery

of 25,000 candle-power requires the delivery of 25,000 watts at the lamps and this during 4 000 hours amounts to 100 000 kilowatt hours, which into the annual expense of \$6 200 gives 62 cents as bo

The Conlings Oil Bistrict, (alifornia. fornie A report on the geology and oil to sources of the Coalings oil district in the western part of Freezo and Kings counties California by Raiph Arnold and Robert Anderson has just been pub-The second second 

Montarcy 110 miles away with San Francisco Bay 200 miles away and with other points

The report describes the topography geology paleon plogy and oil in the Coalinga district which have en in part described in an earlier report published the Survey but not now obtainable. The present by the Survey but not now obtainable report includes a more complete discussion of the district and many new maps sections and other illus-trations besides a paper by Irving C Alicn on the chemical and physical properties of the oils Man-interesting points in connection with the history of th macressing points in connection with the history of the region in past geologic ages are brought out and by means of careful descriptions of the formatine a foundation is laid both for an accurate study of the occurrence of oil within this region and for the tracing of formations and oil horizons in other parts of Cali

the report covers 354 pages and includes 52 plates and J text figures. The characteristic fessils of the tocks of the region are fully illustrated. These afford a means of identifying particular strata from place to

a means of identifying particular strats from place and of determining the depth and position of the oil bearing sands like discussions of the oil rones of the factors affecting the accumulation and the gravity of the oil of the relations of oil and water and of the origin of the oil are of broad general interest The maps and diagra the detailed accounts of the geology of the wells and the chuseter of their vari ous products are of decidedly practical immediate value

Bulktin 198 may be obtained without it by applying to the Director of the Burvey at Washington

The Current Supplement,
The opening article of the current
BULLEMENT No 1740 deals with electro chemical action and boiler corrosion

View of the lake, showing the start and fixtures on the poles for 500 of these lamps all erected and con those lamps all erected and con sected complete and ready to operate For this 30 000 candle-power plant as above with 500 lamp fixtures erected the total first cost is \$14 200

The "Minnehaha" being token out for evector the total first cost is \$14,200. The "Mileston Tile costs per cantileprower capacity giving \$2540 per 40 candle lamp. This cost of plant is based on present market prices of materials ishor and apparatus and assumes ordinary conditions at the place of evection. In places, where prices and freight rate, are higher than

lished by the United States Geological Survey as Bulle

tin 398 The district described which is about 15 miles wide and 50 miles long stretches along the northeast base of

the Diablo Range and in cludes a band of productive oil land i miles wide and is miles long at its north end and a narrow strip of oil land along its southwestern boundary

The region includes about 550 producing wells which range in depth from 600 to 4 000 feet and ponetrate from 20 to 200 feet of oil sand. The product ranges from a black oil of 15 deg. Baumé to a green ell of 3 deg. Baumé. The yield of single wells differs greatly

oeg saume 'ne yield of single wells olin'rs greatly ranging from 3 to 3000 barrels a day.

The district is the leading producer in california and ont of the most productive in the world Its production in 1907 was 88717.73 barrels in 1904 it was 10 388 188 barrels, and in 1909 it was probably if

700 000 barrels or more
The total quantity of oil thus far taken from the ground in the district to the end of 1909 was about 63 000 000 barrels of 42 gallons each leaving available a vast store of oil which has been roughly estimate da 2.747,000,000 barrels. Even if this great quantity of oil is in the ground it is not possible to state whether all of it can were be obtained. Pipe lines connect the district with the scaboard at

there is often much loss thinking and loss taiking concerning the stability of occasioning steamers among those who ought to be built in formed than commaints made sometimes are in to find eat. The matter is set right in an ear-line article stitled Stability of Snipe Edward Person gives some interesting case concerning the constitution. Tunnels in the ing and Tunnels to Come is the title of an article which gives much useful information. Richard Thirsk contributes an instructive account of the Ger man army and shows how wonderful the military system of Germany is I has L Cowan contributes a ood article on the Story of Silk accompanied by

The "Sunny Jim ' makes a great pace,

many excellent photographs The newspapers recently published articles on the

discovery of what was prenounced to be the greatest radium vein even discovered in the United States in Lincoln County Montana Inquiry of the Geo logical Survey reveals the fact that there is very little if any truth in the statements made

"Mornima," model of a steam

"Fairheime," on electric liner

"Belvedere II," a gasoline model.

"Lusus," a gusoline craft. Note the

## ROUGIER'S SPECTACULAR MONACO FLIGHTS

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

A year ago, despite the offering of substantial prizes for flights across the liny of Mouseo, no avi alor made the attempt. This year housever, such hig strides have been made in the art of light that there probably a gaver of substores who are willings to try a flight out water, even without any special grangements he hig, made, for landing in this ele-

much in case they are forced to do this. With the spectrular flights of Paulhan and Charles K. Hamilton over the Pacific Ocean last January as an example, longier, a famous French cyclist and untomobilist who has lastly joined the flying ranks early last month made some thrilling flights above Mousac Bay photographs of which we reproduce

carly last month made some thrilling linguia above. Monaco Bay photographs of which we reproduce. The first flight of an aeropiane over Monaco Bay was made on March 3rd Starting from the quay. Rougier described a figure (light above the bay and flew our Cape Martin at a height of 265 feel. He landed safely at his starting point after a flight of the intended.

Nonpie'rs second flight above the bay was made on the 6th utiline in the presence of the Prince of Monace and a large number of apeciators. This and the flight the next day were each from 5 to 10 minutes' duration. On the 7th he passed 100 front above the line of fortifications as abown in our front-page

illustration, and flew straight across the bay, attaining a height of 1,000 fet above Cape Martin Despite some rather strong wind mails into illustration and and without tipping dan and without tipping dan grounly On his way back to the starting point Rougier performed evolutions above the castino of Monte Carlo at a height of 300 frest Flankly he flew back in the rock of the wake in the rock of the castino and the same precision upon the narrow ones.

On March 8th he again started from the quay of the port, and five straight for Chap Martin, across the bay 11 row to a beight of 600 five the seribed a circle above the bay passed over the rocky shore at Monaco and lands at his cast sized lands at his longest and man spectraline flight. The nort day he made his longest and to 10 MeV. Marting at 1 to MeV. Marting at 1 to 10 MeV. Startling at 1 to 10 MeV. Startling at 1 to 10 MeV. Startling has the lands at 10 MeV. The series are the series of the series

Then, still rising, in fiew above Mont Eged felvers of 20% feel; Dashing over the summit, he fick to 1.4 Turbh, where he turned at a height of 300 feet, and few back to his satring point. The length of this flight was 28 minutes and 15 seconds. On March to 10th Rougher assain fiew around the Bay of Monnec and on the 17th in made another the Bay of Monnec and on the 17th in made another the Bay of Monnec and on the 17th in made another the Bay of Monnec and on the 17th in made another the Bay of Monnec and on the 17th in made another the Bay of Monnec and on the 17th in made another the Bay of Monnec and the 18th of the 18th of 18t

## Asronautic News at Home and Abroad.

Resides the record sights by Rongier above Monaco Naz, Le Bion, souther famous automobile racing afterwho has been flying a Bieriot monoplane, made a wonderful light above the Bay of Ran Schastian, Rpain, on the 2nd Instant: the started in a high wind, and made several circles above the bay at a height of Defeet, when suddenly the monoplane taged upside down, and fell into the shalines waiter. The interpold cover, and fell into the shalines waiter. The interpold cover in the shalines were the shall be shall be

cossive power and the gyroscopic action of the motor undoubtedly had something to do with both of these fatal accidents. Le Blom made a speed record of 43 3 miles an hour (5 kilometers in 4 minutes 2 seconds) at the Heliopolis aviation meeting pear Cairo last January

## ACCIDENT TO A CUSTISS SIPLANS.

While fifting in a Curtiss biplane above 6an Frantice Bay at Alameta, Cal., on the 6th instant Frank Johnson plunged into the water from a height of 30 feet owing to his losing countrol of the architecture of the country of the country of the control of the architecture himself from the aeroplane, (which was not haddy along any of the country of the country of the country of the property of the country of the country of the country of the property of the country of the country of the country of the property of the country o

### FIRST TEST OF PARSEVAL MONOPLANE.

The first test of Major von Farseval's large moneplann occurred on the 14th instant above Lake Plau, in Ocrusary This machine lass a spread and length of 45 feet, and is fitted with a 13bborse-power de-plinder motor. The trial fights were made in a violent and gusty wind with two men in the machine. The moneplane capsized, and fell into the lake. The two ongineers, 10st and 18to human, were reacoud. This mathine is previoled with both wheels and floats, but

Rougher flying over the yachts in the Bay of Monace in his Voisia biplane.
THE AVIATOR FLEW OVER MOST EGEL (ELEVATION 2008 FEET), AND THEILIRD MOSACO FOR TWO WRITER

whether or not it started from the water is not known

RE YOL.

Credit for producing the first scropiane to rise from water and far must apparently be given to M Heart Pabre, who, according to the French Journal L'Acro, succeided in griting his combined hydropiane and arropiane to leave the water and make several flights 1,200 to 1,500 feet in length at heights of from 6 to 10 feet he experiments were made at the Fort de la Mêde at Martigues, a city near Marseilles. The first accessful flight from water was made on March Sizi.

NEW RECORDS OF PLIGHT WITH PASSENGERS.

On the 5th ultime Henry Farman broke all records of tight with one or more passengers by carrying Mr Howardson, of the Daily Mail, and Mme Frank for I bour, I minute and 25 seconds. The performance was accomplished with at new and samiler biplane than he has been in the habit of using. Just a mosth later, on the 8th instant. Do tel Kinet, a Belgian, broke the worlds record for allow facts of the beautiful than the procedure and the influence and influe

### A NEW CROSS-COURTBY MICHEL.

Emile Dubonnet, on April 3rd, won the 100-kilo meter (62-mile) cross-country flight prise offared by La Nature He made a fine flight from Savignyaur-Orge to Perti-811 At hin (about 68 miles) in 1 hour and 50 miluties

REPORT OF A PROPERTIES BREAKING IN PLESHY.
While practising at Pau with his Biériot monoulane

on the 26th altime, Leblane had a narrow escape. He was at an estimated height of 900 feet when his propeller broke and few off. Quickly stopping his more, Leblane skillfully gilded to earth amid the cheers of the measurement.

### The Assent of House Religion.

Three months say, a near to not some surprise blood in Falrians, Assan, for the desire and the Falrians, Assan, for the desire and the Falrians, Assan, for the sum of the say o

No trace of Dr Cook's ascent could be found on either of the two peaks which constitute Mount McKinley No records of his were discovered

Various cetimates have been made of the moun tain's height. W A Dickoy, an American prospector, estimated it at 20,000 feet, and gave the peak its present name. Robert Dunn, who made four attempts to climb the peak, estimated its height at 20,300 feet.

Insamuch as the present party was not properly equipped to measure the height of the mountain, its achievement is not of much asfentite wature much as feet the present of Columbia the past regarding to the past from the cilmbia the past regarding to the past from the south the past from the south the glester and various phenomen. He will take glester and various phenomen. He will take with him scientific instruments, by the skillful use of which undoubtedly

more information will be obtained than could be secured by a party of four unscientific but hardy explorers. Barril, the guide who exposed Cook, is inclined to disbute Lloyd's claim

### A New Way of Lighting Mages

A new system of electric lighting for theator sweez as tried not long since at the importal Opera of Berlin, and, it is stated, with great success. It is the inswittion of the Spanish engineer, Fortuny, and uses an are lamp as the source of light. The rays of the importance of the state of

## An Automatic Projecting Lantern with Electrical Control

BY JACQUES BOYER

Hitherto it has been necessary for a lecturer using lantern illustrations to employ an assistant to operate the lantern and insert each slide at the proper moment M Moulin has invented an automatic lantern (Fig. 1) which dispenses with the services of the assistant. The ingenious mechanism which inserts and removes the slides can be adapted to any projecting lar the sildes can be adapted to any projecting lantern and enables the lecture, by pressing an electric but ton on the platform, to show any picture at will The invention will be especially serviceable to teachers, as is shown by Fig. 4. The pictures can be thrown on the white wall of the class room, and if a powerful source of light is employed it will not be necessary to darken the room to an extent sufficient to prevent the taking of notes or the use of the blackboard

The lantern slides are attached to a conveyor, com posed of two chains connected by grooved cross-bars, which pass over a skeleton drum, formed of two iron disks connected by six rods Each slide is firmly held between a fixed and a movable but of the conveyor by

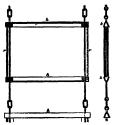


Fig 2.-Frent and side views of chains carrying slide holders

the tension of the apring r (Fig 2). The drum is turned by a small electric motor, by means of a tau gent arrow, and, as it rotates, the slides are brought successively opposite the projecting lens

operation the flexible con veyor carrying the slides is taken up from a box behind the drum and delivered to a receiving box beneath the

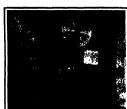
The motor wound, so that it can be reversed by reversing the current in the armature current in the armature coils. In this way a slide which has alroady passed the lens can be brought back and projected again, if desired The electrical connections by means of which the apparatus is con-trolled are shown diagram matically in Fig 3 Be-neath the locture table is a switch I, the closure of which sends a current through the electric are A of the projecting lantern, and also through the field culls 8 of the motor, which with the circuit containing the are and its rhecetat On the table are two double contact keys a and a' upper contacts of these keys, 1 and 1', are connected with one wire of the gen-eral circuit, the lower contacts. 2 and 2', are con-nected with the other wire, and the fixed ends of the keys are connected, re-spectively, with the two attached to the rotor or mature B of the electric remove a ur use electric sotor. Hence, when neither ay is depressed, both reades are in connection with the same main wire, at no current flows

By pressing the key a, the current is seni tionies By pressing the way of the threats as well through the rotor circuit in the direction indicated by the arrows, and by releasing a and depressing a the current and the rotation of the motor are reversed. incandescent lamps L and L' are bridged on the



Fig. 1 .- An automatic projecting lantern.

keys to diminish sparking but they also serve another usoful purpose When the key a is partially depressed so that it does not touch either contact, the rotor cir cult is completed through the lamp L, which greatly increases the resistance of the circuit, and the current flowing through the rotor is further diminished by more than one-half by the shunt effect of the lamp L' Hence, the motor trans-Hence, the motor turns so slowly that it is an casy matter to stop the desired silde exactly in front of the lens, by releasing the key a at the proper mo-ment. Neither of these effects is produced when the key a is fully depressed, because the lamp L is then short-circuited by the key and the resistance of the circuit is thus made so small that very little current is diverted through the other lamp. A slow movement



of the motor and the slides in the reverse direction is similarly produced by partially depressing the key i Tides of Pass

The average time of high water at places on the Pa cific coast of the Central American isthmus is three hours after the moon's meridian passage at Panama The average time of high water at Colon is six minutes, and at Greytown one hour after the moon's meridian passage at Colon In other words, as Colon and Panama are nearly on the same meridian, it may be stated that high tide will occur at the Pacific or Panams old of the Panama Canal, on the average two hours and fifty-four minutes after high tide at the At lantic or Colon end, and high tide will occur at the Pacific or Brito end of the Nicaragus Canal route two hours after high tide at the Atlantic or Greytown and

The level of mean tide is practically the same at both onds of both of these isthmian canal routes, but at Panama the tide ranges from 10 feet above to 10 feet below mean sea level, while at Colon it only ranges from 6 or 8 inches above to 6 or 8 inches belo

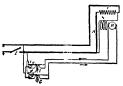


Fig 8 .- Electric withing for automatic projector.

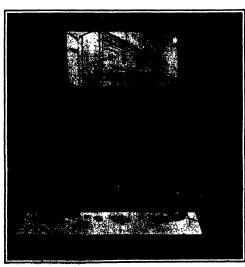
mean sea level, and at Brito or San Juan del Sur the tide ranges in the extreme from 4 feet above to 5 feet below mean sea level, while at Greytown it ranges less than 5 inches above and below mean sea level

Thus with a seabyel canal built along either the Nicaragus or the Panama route, there would be through currents from the Pacific to the Atlantic at the times of high tides at the Pacific termini, and from

the Atlantic to the Pacific at the times of low tide at

the Partie travial In answer to the spe question Assuming that the Pacific tide rises about 8 feet suppose it to be high tide at San Juan del Sur Nicaragua, at noon stand ard time, what would be the approximate difference in level of the Atlantic at the same time sav at town Nieragus" i it may be stated that at the time of high tide at San Juan del Sur it is two lones after high tide at Gary town, and if the assumed del Sur la above me in sen level the difference in level between the two ends of the ennal would be about 7%

mation with reference the weather conditions Dr William Shaw Director of the Meteorological Office of Great Britain, has been traveling in western Cantraveling in western Can-ada With reference to the alleged general changes in the climate owing to the settlement of the country Dr Shaw is skeptical He that the people of all locali ties are under the impres their district is undergoing a change. The statistics do not however hear out this idea. There are oscilla. idea There are oscilla-tions but no permanent



Mr. 4 and lacture illustrated by the automatic projector, controlled by the lecturer inmedia AN AUTOMATIN APPARATUS FOR PROJECTING PICTURES.

# INSECT PESTS IN HOUSE AND STORE

BY HAROLD BASTIN

Insects as a class feed literally upon anything and everything from which nourishment may be extracted by dint of strong laws back d up by equally strong directions A substance may be bone dry, almost as hard as rock and in every way uninvising, yet so

long as its origin is three-able to the animal of vestable three animal of vestable three-animal of the animal of vestable three-animal of the animal of the animal three-animal three-anim

thequer of this country by such leavests as the Colorado bevelo and the "scales" of the orange groves. But it is with certain posts which while lead evanating in their activities, affect clearly the individual comfort of our readers that writer proposes briefly to deal in this place. Probably fee people realize what a number of insect pests were prepared to the very father or our dwelling pages.—that is, so far as the woodwork is concerned. They herewise how our furniture and our books, and con sume by alow degrees the very carputs on our foors and the clothlicity in our closests and presses.

Among the most widerly distributed of these domestic he posts are certain tup bestics of the genus Anobius Their antevetral home was in the woods and lance where they are utili abundantly corresented, frequenting the dond branches of trees and shrubs. They have been considered they have been considered to the control of the control of

scattered about the surface of the woodwork—much as though the piece of furniture had been "peppered" from a distance with a charge of durchot. These signs are indeputable evidence that your chair is bestle-riddied, and unless by some means you can



Clause demaged by the tabacco bestle,

contrive to dislodge the pests, they will slowly but surely reduce the woodwork to dust and chips

When once a piece of furniture is assailed by Anobiam, it is a very difficult matter to cradicate the post. Several methods have been suggested One plan is to place the piece of furniture in a refrigerating chamber



Dust from the borings the cork-caterpillar on a bottle-neck



ine bottle cork showle

for a week or two, and thus attempt to kill the beetles and their grubs by cold. It is somewhat doubtful, however, whether even this severe ordeal will destroy all the beetles. Another way, and probably a most effectual one, is to place the furniture—first taking it to pieces if necessary—in a hot chamber or oven, and there bake it for twenty four hours or more. If the

temperature be kept h little above that of footing water, not a single bestle will be alive when the lighing is over. Often it would be impossible to adopt either of these methods, and in such cases the best plan is first to place the piece of furniture in a very

to place the piece of turniture in a very hot round for some hours, these to inject, by means of a very fine-cone ject, by means of a very fine-cone crossors or craphic of potassism—tels as many of the tity "worm holes" as can be found on the surface. Then remove the furniture at once to a cold place, when the sudden change of temperature will cause the potencion faune to be drawn into the impremient reto be drawn into the impresent proboise on the surface should be stopped up with parafilm wax.

The various species of Anobism, and their bigger relatives of the ganus Restobium, by no means confine their attacks to furniture The whole wood-

work of old houses has been so completely ridded by their borings as to render the structures unsafe. Indeed, a beam that has been tenanted by these insects for a number of years is little better than an outer shell containing a mass of wood-dust. A photograph showing damage done to woodwork is here seyned done to woodwork is here seyned when the shewing damage done to woodwork is here seyned with a done was also in in the shall of making a tag-with a done when also is the shall of making a tag-with a done when the shall be should be shall be sha

the did "eath-watch" theory has been exploded.
While speaking of these bettles, the writer may mention another insect hawvas as the "book-louse." It is very mituse, sort, and wingless. Its color is that in very mituse, sort, and wingless. Its color is that "white anta" of tropical countries. Arroys the control of the control of the color of



to apple (cut in haires) which has been the bosns of a cateroliar of the codin-moth.



Oinger root situeked by the paste



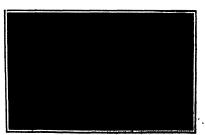
Olganettes demagned by the tobacco



A book showing the ravages of the



Old Java coffee beam showing the borings of



Messent attacked by the parts beath, INSECT PROTE IN MOURE AND STREET,



Combas of School Confession) with the last bearing



### PERSON CONSTRUCTION AND OUR ANNUAL FIRE LOSS.

It is estimated that our annual fire loss and the am expended for fire protection, etc., represent an annual sum that is approximately equal to the cost of building the Panama Canal The public is

awakening to the cance of this fact, and business mer rally are boginning to realise that the best way selves against the fire peril is, not so much to institute extinguishing fires and burden themselves with heavy insurar ce, as to so greet their build. ings that it will be difficult for a serious fire to origidoes, imp for it to obtain a



Applying the plaster to a rib-stiffcued steal lath and plaster p

both the ribs and the inth being made from the same shoot of steel. The object of the ribs is to give suffi-cient attifaces and rigidity to the fint, so that are required by the ordinary plain lath, will be necessary. When it is used as reinforcement for foor and roof slabs, no wood centering or falsework is re-quired, for the ribs give the required stiffaces. If this sheathing is used for partitions, it is most provided to the results of the required stiffaces. If this sheathing is used for partitions, it is more becausery to provide a fastening at the foor and the ceilling. The sheat are then eat in usace and the

wweenty to provide a matering at the noor and the sling. The sheets are then sot in place and the laster applied directly to both sides. For sidings of factories and similar one and two-tory buildings, a framework of steel or controto is



Building a roof of reinforced concrete construction,

### FIRE-PROOF COMMERNOTION

for it to outsin -serious hold upon the building The growth in favor of fireproof con struction has been indirectly stimulated by the growing price of lumber, the advance having been so great that for some forms of construction there is but little extra initial cost involved in putting up strictly fireproconstruction. Indeed, from an investment standpoint it can be demonstrated that the fireproof building is construction. Indeed, from an investment standpoint it can be demonstrated that the freproof building is the only really economical building. The saving in the cost of insurance, reduction in depreciation. the only really economical building. The saving in the cost of insurance, reduction in depreciation charges, the guarantee sgainst interruption of busi-ness by five, combine to make an unburnable building the cheapest in the long run.

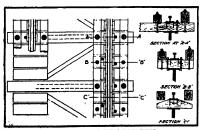
The phenomenal development in reinforced concrete

construction must be regarded as one of the most sig nifeant movements in the broad field of architecture d engineering It is not too much to claim that and engineering It is not too much to claim that the blow's share of improvements in this direction is to be credited to American engineers. The experi-mental work on sample structural members, and espe-cially upon beams and columns, has led to a pretty thorough knowledge of the tree principles of cen-struction to be adopted for reinforced concrete when used in such members, and the introduction of a reinforcement designed to selecutely take up the sharing strains, as supplied for instance it has belied system, has made it possible to produce hums define experiments. The sharing strains and other members subject to bending provided to which the sheets are attached. Lines of orts are provided, about six feet apart and the ly Rib is properly fastened to them. The fram work is similar to that which would be provided where the ordinary wood sheathing or corrugated from used, except that the girts can be placed a greater distan When the steel has been properly e apart. placed a special stucco plaster is applied in two costs

Where the system is used in connection with floors and roofs, supports are ordinarily provided about five feet apart. The aboets are laid directly over the sup-ports with the lath face downward. All that is necessary to complete the work is to put in the concrete on the upper sides of the sheets to the required thick ness. Only a sufficient amount of concrete will flow through to give a thorough clinch on the steel leaves a roughened surface on the underside, which provides a satisfactory key for the plaster applied on the ceiling below By use of reinforcing materials similar to this, nearly every type of building no mut ter how small, may be built firsproof at a cost very little greater than the ordinary wood framing

IMPROVED BLEVATED BAILWAY CONSTRUCTION The combination cross tie and tion shown in the accompanying drawing has for its object to reduce the not

panying drawing has for us so of elevated railroads and increase the light to the street below. An open con struction is provided yet the rails have an almost continuous support which continuous support which tends to absorb and stop the vibration sent out from the rails. Most of the noise from a train on an olevated structure is due to the pas-sage of the wheels over the rall joints and there is no doubt that this noise is intensified by the inefficient support of the rails at such points. Should the three "block" ties be removed, letting the rall free of sup port, and a wheel be rolled over the rail, the vibrating noise would be very great By inserting 'block' ties between, this noise is de-creased in proportion to the



PEPROVED ELEVATED BALLWAY CONSTRUCTION

s, whose strength can be determined with dele accuracy.

pencion)s accuracy.

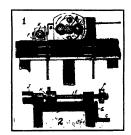
Side by ride with the development of reinforced
concepts members, such as are suitable to what might
be called the skeleten frame of concrete building,
maps, experimental work has been done in producing sixph experimental work has been done in producing an absolute form of wailing or panelius, for filling fat the bread opes surface represented by the wail agence, the drover such care cording. In the accompanying illustrations we show what is known as the 10-28 method of stool absolution, which is an interesting open of stretchment flower that the consistency of the contract of t number of ties inserted until when a continuous sup number of the inserted until when a continuous apport is made the noise is reduced to a minimum it is but natural for engineers to copy precedents, and for this reason the usual system of cross ties, which, by a process of evolution, has been found most satisfactory for a road constructed on the ground has been adopted for elevated railroads, with th has been adopted for elevated railroads, with the result that an excessive amount of noise is produced whenever a train passes over the rails, and the street is uncoessarily darkoned by the multiplicity of cross ties. This proposed system of building an elevated railroad has been engagested by Hr Carl E. Klok, of 1243 Columbia Avenue, Chicago, III.

## ATTACEMENT FOR WOODWORKING MACHINES.

The accompanying engraving illustrates an attach ment for woodworking machines generally known as molders or stickers used in such and door factories for cutting rabbets and moldings in the parts to receive the panels. When a door is to be provided with a pane of glass, it is usually necessary to cut away the molding or rabbet at one side so that the glass can be inserted when the door is completed and be held in position in the usual manner by means of putty - 10 to avoid a second on ration to cut away the n ing for this purpose the auxiliary enter shown in the accompanying engraving is provided. The auxil-iary cutter is arranged to be moved axially into and

out of operative position, so that when it is no longaway the molding the operation of the auxiliary cut ter can be stopped in Fig. 1, which shows a face view of the machine the main shaft is shown at 4 and mounted upon it is the main cutter head, provided with the cutters B which form the rabbet and mold ing immediately In front of the cut-C on which the

work is supported and a pair of guides D for holding the work in post tion. The auxiliary cutter is mounted on a shaft F. It consists preferably of a square cutter head provided with a pair of blades F. Fig. 2 shows a side view of tion the auxiliary cutter moved to inoperative position so yoke and collar H by which it may be moved axially so as to bring the cutter into engagement with the



ATTACHMENT FOR WOODWORKING MACRINES

work G The driving pulley of the shaft E is shown at The inventor of this attachment is Mr A C Figpett of 1284 Franklin Avenue Astoria Oregon

## SHAFT COUPLING

Pictured in the accompanying engraving is an im-proved coupling of the type adapted for connecting the proven coupling of the type adapted for connecting the abutting ends of two revoluble shafts. Briefly the device consists of a key and a sieve which serves to hold the key in place while a second looking key serves to retain the sleave in position over the two serves to redsh the slowe in position over the two shafts As shown more charge in the actional via w. Fig. 2 and in Fig. 5, a keyway is cut in each slash, and a pit or recess is formed at the end of the keyway. The shafts are turned so that the two key ways are in alignment and then a key of the form shown in Fig. 4, and indicated at A in Fig. 2 is fitted into the keyway. The key is provided with largs at the end adapted to fit into the pits of the Before bringing the shafts together, a skew C is fitted over one of them This sleeve as shown C is fitted over one of them. This sleven as shown the cross-sectional view, Fig. is for rough with a keyway adapted to fit over the key A when it is newed over the abstuting ends of the shafts. To indict the sleve in position, the key D is used. This fits on a exterior keyway in the slever C and is provided with a pair of lugs E which plans through the slever in the two shafts. A girw F areves to hold the key D to the elseve C. In this manner the we shafts are raightly connected. Owing to the large

## Scientific American

diameter and massive construction of the sleeve O and owing to the manner in which the two kys are interforked the coupling has a strugth qual to that of any portion of either shaft. When the shafts are coupled they are in 11 in aliann it with each and it impossible to turn on shift relatively to the cher xe prily a fr sufficient to meitlet them to a considerable xt at A ja at on this coupling has



A STRONG SHAFT COUPLING

l n secur 1 ly Mr William F liaum of 2802 Gedar Street I bliadelj bla I s

A NEW SYSTEM FOR HIGH TENSION INSULATION A jatent i cently less id to Leuis Steinbriger of Brooklyn N Y covers a novel and improved system of insulation for high potential electric conductors to be used in various relations and for various purpor such us yow r transmission and for guy wis so ca-bke on ployed as stave for textle or poke masts and other support used in virtues telegraphy and telephony as will as in regular commercial work it marks a radical dejutire in the development of in sulator systems
The system omprehends a serie of insulators pro-

ine system ompicements a serie of insulators pre-ferably of a thimble type and a serie so of other finan-ators of a rod (v): the thimble type insulators being all mate! with the rod type insulators and together therewith forming a it atble chain of parts which may be extended indefinitely

the under surface of the thimble type insulators will be of course at all times comparatively dry Lach thin bl type insulator acts like an umbrella cov vering the upp 1 and of the rod type insulator below



This system will practically prevent lonkas and undesirable grounding of the current either from conductors () from support ug stru tures for

in this system the various parts usy be readily detached and re placed by other total number of parts may be in creased or dim inished at will



A NEW SYSTEM OF RIGH-TRUSION INSULATION

STRIPLE LETTER SOAIR.

An inventor has recently struck upon the simple idea of using coins to weigh letters, so that the value of the coin will represent the value of the stamp that of the coin will represent the water of the scamp tast must be applied to the letter. A simple beam scale is used provided at one end with a slip for holding the tester and at the other end with a slip for holding the coins. If the scale is to be used for first-class mail the rates for which are two cents an ounce the riterum of the scale is so place of that a letter weighting an ounce would be just counterbalanced by two onean ounce would be just count-relatanced by two one-cent coins in the other cipl. As shown in our filtu-tration the scale beam is made of sheet metal beat to channel form with the cufe turned over and termin sting. In kulft deged prious on which the letter and clin clips are suspended: A detail of one of these clips is shown in Fig. 2. It is made of a single piece of metal bast to firm two jaws which may be registent or crimped to provide a better gripping surface. At the upper and of the clip are two cars bent upward and provided with apertures to receive the pivots of the scale beam. A ball shaped handle serves as a fulcrum scale bound. A ball shaped handle serves as a faircrum for the scale. In order to adjust the scale securately a metal polar is provided on the under side of the which has alternum and the polar and are bent back upon it to hold it in place as indicated in Fig. 3. The polar may be delicately adjusted to bring the scale to a correct balance. The inventor of this lagen into letter scale is far Willia J Fink, of Bin Point South Dakota

INLET VALVE AND SCREEN FOR PUMPS

device which is illustrated in the accomping engraving is adapted particularly for use in con



SIMPLE LETTER SCALE

nection with water pumps in boats the object being to strain the water that is drawn in by the pun strainer is provided with a special attachment whereby it may be () ansed instantly while the valve is in sorvice. The body of the valve is indicated at A in the sorvice. The sony or the varies is indicated as a in case illustrations and is provided with a branch B whereby it may be connected with the pump. The lower portlop of the body is enlarged to form a valve case C. Screwed or tan boody is omarged to form a valve, cage C. Seresson to the cage is an extransion number D which at its lower end is found with a screen E. A valve seat plate F is secured in the chamber O and upon it rests the valve O i uns H in the top of the chamber O tuns H in the top of the chamber O. serve to limit the upward lift of the valve & Passing centrally through the valve and casing is a rod J which at its lower end is fitted with a pair of blades A. These are adapted to be pressed against the outer



DILET VALVE AND MIRROR FOR PURPL

surface of the screen H under tension of a coil spring L By rotating the rod I the bindes K are caused to scrape the screen H, and thus remove any dirt that might clog the openings of the screen. Mr Olof E. Lillyman, of Potiatoh, Idaho, has just secured a patent on this improved inhet varive and screen

THE INVESTOR OF DIVISO ARROR

Among ploneer investors to whom the diving dress in its present perfected form ewes so much, was Wil-liam Hannis Taylor The previous 'hit or miss attempts were su

perseded by the Taylor patent of June 20th 1838 (No 578) in which the essential featur was the valve allowing the emission of con-sumed air without an influx of water Previ ous to this time there had been the diving chests and the diving bell of which the lat ter introduced by Smeaton in 1778 was the safest and most practical device for submarine exploration The diving bell been developed along aide of the diving dress and is still in use

The general appear ance of Paylors diving armor was like that of a knight s suit of mail

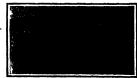


FIRST DIVING ARMOR.

except for a prominer bulge in the body ple A large pipe com from the surface and penetrating the body piece at the bulge supplied the fresh air while a short pipe entered the body piece on the other side and was provided with a valve which carried off the exhaust Although diving armor has now reached its terfected state this valve has never been materially improved upon The accompanying illustration is re-troduced from Mr Taylors patent

### AN IMPROVED TORAGOO PIPE.

The principal objection to a tobacco pipe as every smoker knows lies in the fact that nicotine accumu smoote grows nee in the inct that income second ince to such an extent as to partially clop the stem and detached partition of the distrateful drug are apt to be drawn into the mouth. The saliva is also apt to flow into the stem and collect there. To obviate those disagreeable features of the ordinary stem many inventions have been made designed to trap the saliva and the nkotine. The accompanying ongraving illustrates one of the latest inventions along this line. The pipe bowl is provided with two openings one above the other and these are adapted to communiabove the other and these are adapted to communi-cate with two channels in the stem. The stem is pro-vided with a core piece in which the channels are formed. The core is indicated in the cross sectional view. Fig. 2 and is shown in full in the large view. Fig 1 The upper channel extends the full length of the core and through this the smoke is drawn Near the inner end of the stem the core is provided with several ducts extending downwardly a wardly to the lower channel of the core so that any nicotine or solid and liquid particles drawn up with the smoke will be trapped by the ducts and will accu



AT INFROVED TORAGOO PIPEL

ulate in the lower channel. It will be of mulais in the lower channel It will be observed that the lower channel does not extend the full images of the core, so that it is impossible to draw any of the core, so that it is impossible to draw any of the core a chamber is formed in the bottom of the core a chamber is formed in the bottom of the core piece which communicates with the smoke channel mear the mostlypice. This serves to trap the saftre that may enter the smoke channel. The ptem of the pipe is jointed near the center so that the outer seek that may enter the smoke channel. The ptem of the pipe is jointed near the center so that the outer seek that may enter the smoke channel. The present of the pipe is jointed near the center so that the outer seek that may only the present of the pipe in the core pipes without part of the things that the core is the core pipes of the present of the safety of the Books is the lower in the pipe of the present of the present of the pipe is the core in the pipe of the pipe is the core in the pipe of the pipe is the pipe of the pipe of the pipe is the pipe of th d pipe in Mr Georgia Bradley, of 919 Ib Spokane, Wash.

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EMEMOY PROPE IN STREET AND STREET, called "alling" (Government from some field), sects. My reason in stendarding its in indicatinguates that page fine in the page of the capable of making a require register professe them, noise which is suddle to mankind. The standard of the capable of making a require register professe than some which is suddle to mankind. The standard contracts of the capable of the capable of making a register to the capable of the making a suddle capable in the capable of the its body, make it difficult to understand how this noise can be prodoced, but I give the fact on the authority of an enfact observer. Before leaving the bidying beetles of the genns Anothem menton should be made of the species known popularly as the bread or paste bestle (A pencieswa). It is very common in houses and possesses a voracloss appetite Morrowr, it cannot be termed 'dainty." for it appears to est almost anything which it accountants, from dry anny, for it appears to eat amoust anything which it encounters, from dry wood to Cayenne pepper, although it seems especially to appreciate bread, bis-cuits or other concoctions in which flour and water are the chief ingredients. It seems supecially to appreciate bread, bismilitary controlled to the controlled to

edges of the pages and drill their tun-laples, making a hole so small that it is neal from corte to core of the volumes innoticeable when the apple attains the The photograph reproduced here with five some foles of the serious damage of no first and the provided the phenome-give some foles of the serious damage of the provided the phenome-give some foles of the serious damage of the provided the phenome-give some foles. The provided the phenome-give some foles are stated as a warning to all lores of 'fract lores excent to be an intitle gas any of editions' and other courty tomes. In the might have a serious the provided the phenome-give some foles are serious to the serious damage of the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the phenome-give some foles are serious to the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foles are serious to the provided the phenome-give some foliations are serious to the phenome times past chancy valuable books have "wind the group is that red it cores in manner while those is a case on reversi spins a core of rough shift in a cveries in which twenty-seven follow relumes, in the tree trunk, or on a neighboring standing sides by side, were perforated fence in which it changes to a purpose in a straight line by one Asobies group. Despite its name, the could most does not make the could be supported to the contract of the country of book worm. It is tuned was a poer-

nees of their heads and the strength of its distribution of their jaw musch people, save those on the property of the property the world.

In a rear directed by this post, and deproductions represent an annual loss of deproductions represent an annual loss of control of the control renounced the transitional arrandomentally thabits of moths in general, and to frequent by choice the gloom of subternates a vanish. Here the female insect lays her eggs upon the corks of wine bottles, and when the tiny caterpillars batch they burrow into the substance of the cork, just as the exterpillar of the big goat moth burrows into the heart of an oak or an apple tree.

The presence of the wine-cork pest is

haten and, fakknissians toying sine salar, indicatingstatic; and even within factoring states; now the salar sine profites titings, the wine smally lose statistic, and is thus rendered values times squired by the caterplians. News new corts in actors at times squired by the salar states of the salar states and much though in this instances are appears to be a recently sequited for this insect in question is resuly the moth (Ephaerite forestic) as its a limited, the caterplians from the merchall implies, its enterpillars feed nor dried figs. So prevalent is this it may almost be described as a It may almost be described as a common, object of the dessert table, for few figs, wave the most recently imported, are quite free from the small white grube of this moth. In passing, it may be re-marked that this insect is also known to attack eccess beans. But while the fig moth accomplishes

worthless a stock of boots and shoos juliar confines its attack chiefly to the which, before the advent of the pset, had ombror of the fruit, where it feeds upon been valued at many thousands of the pips and core. Sometimes a most pounds. This happened in South Africa, diciliouchooking apple, apparently perathough reports of demage have also feetly sound, proves to be full of rottenbeen received from manufacturers in mes on being out open. It may be that other parts of the world Prate had the roader is wondering how the easterness and the roader is the easterness and the roader is the damping of the damp Iterally to rags.

The so-called pasts bestle, moreover, forming she visit and the season when the young applies are inspections. The so-called pasts bestle, moreover, forming she visits one fruit after such sprobably the worst offender among the olds libraries, and its grube growt to exterpillar burrows into the heart of the delays of the pases and drill far tunning the property of the season when the spine states, the minute old libraries, and its grube growt to exterpillar burrows into the heart of the delays of the past of the delays of the delays of the past of the past of the delays of the past of the past of the delays of the past of the delays of the past of

in which straight line by one anobian gruin a straight line by one anobian gruin a straight line by one anobian gruin or "book worn" line tunned was an perin or "book worn" line tunned to the straight line and th in the tree trunk, or on a neighboring fence in which it changes to a pupp. Despite its name, the coddin moth does not confine its attention to any particu-lar variety of apple, but attacks all the best kinds indiscriminately. It has at-tained a very wide geographical range—

years old, almost every berry of which has been bored by this pest. Fortunately the attacks of this bests do not affect the quality of the coffee when ground. Nevertheless, it is quite certain that when revertnesses, it is quite certain that buying old coffee one buys also a or amount of ground-up besties—and fact may be displeasing to many. The presence of the wine-oor peet is fact may be displusing to many. Tell immunificated its an accumulation of coriement of the core of the core. This so from contamination by insectic, one
commission may be seen in one of the
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Another corn pest is a small moth which is especially injurious to stored four Its scientific name is Bepherical kenkerica it is the scourge of the Medi-terranean ports, where it is impossible to stimate the extent of the damage which estimate the extent of the damage which is accomplished. In November, 1887 Ephcetic made its appearance in East London—having been brought thilter, no doubt, in ships. Its presence was fitted detabled in a warehouse at the docks Unluckity, over a thousand tons of flour were stored in close proximity; and, all though all possible efforts were made and though all possible efforts were the extensive them. extraordinary rapidity that the trouble taken was of no avail.

Enggy-top Canopies for Launchea, Experiments have just been completed by the naval constructors with a view to the adoption of a new type of canopy for use on the naval launches Whan the launch of the U S S. "Minne-

when the launch of the U S S. "Minne-sota" was lest in Hampton Roads with several midahipmen on board about a year ago, the fatality was attributed to the fact that the canvas covering used as a protection against the weather was a protection against the weather was fastaned in such a manner that it could not be quickly released, and the men were hopelessly imprisoned in the sinking boat This fact led to much criticism of the type of canopy used and the steam taunches came to be known as 'death

trags."
The constructors have been working on a design intended to overcome that directly, and several types of changies were tested on launches of the Atlantic fleet within the last two or three months The result of these tests is the adoption of what is commonly known as the bugg-top canopy. This is made of can the second of the common that the second of the sec

to those used on automobiles

While the new style of canopy will not
be as durable as the old fashloned one,
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against wind and rain, in case of a collision, and the leunch is in danger of being sunk, it can be quickly put out of the way and not endanger the lives of ants of the boat

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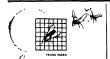
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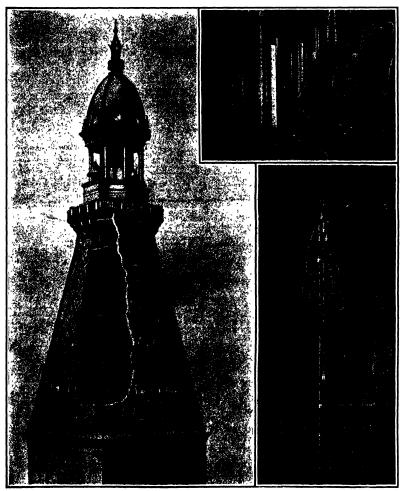
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## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vel. CHL. -No. 18. ]

NEW YORK, APRIL 30, 1910

[10 | KNTH A COPY. | REPLANMENT 104. ]



The upper ends of the elevator shalls.

Motors installed at top of tower

Position of elevators in shafts

## Scientific Aspertour

## SCIENTIFIC AMERICAN

ESTABLISHED 1848

MUNN & CO., Inc., . Editors and Propri

Published Weekly at No. 361 Broadway, New York

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NEW YORK, SATURDAY, APRIL 30th, 1910

The Editor is always giant to receive for examination illustrated strictes on enlighted of thesis justices. If the photographs are shorn, the articles ghort and the facts sutherate the contributions will receive special attention. Accepted articles will be paid for at regular space rates

### WHY NOT A GOOD BOADS LABORATORY!

A life problem of maintaining good roads, always a most important one in the United States, has recently been rendered of critical urgency by the rapid development of the auto-the most destructive vehicle to road surface monise—the most destructive vehicle to road surface that ever ran on our modern highways. The public re-sontment or regret, as the case may be, against the destructive effects of automobile traffic should be tempered by the recognition of the fact that it has been the most active instrument in awakening the public to the necessity for abandoning the old slipshod methods of road building, and constructing them according to the best engineering practice if it were possible to rebuild all our roads of the

If it were possible to robuild all our roads of the most approved and highest class of construction, and if the most suitable material were everywhere available, the problem would be greatly simplified, but such uniform excellence is impossible, both because of the cost and of the difficulty of finding the ideal the cost and of the difficulty of finding the ideal materials within economical hashing distance of the work in a country of such wide extent and such varied geological formation as the United States, the question of the best kind of react to build in any locality must be determined largely by the local con-ditions—the climate, particularly as regards the amount and distribution of the rainfall, the nature amount and distribution of the rainfall, the nature of the underlying soil its bearing quality, capacity for quick drainage, etc., and above all, the character of the materials available for road building, must all enter into the problem

enter into the problem

The French engineers, with their characteristic
thoroughness, have iong recognised the importance and
complexity of the good roads problem, and nearly half a century ago they commenced that careful invest a century ago they commenced that careful investi action which is still being certical on by a force of trained experts. The analytical study of the subject, while was set on foce by M Buttle, Regimer of Roads and Bridges, as far back as 1868 has developed into the present municipal laboratory, which has so greatly extended its field of work that today it is considered by many to be the finest in estimates. the date mentioned, apparatus was installed for testing the restantance to paving materians to wear by rric-tion, which was followed by a machine for testing the resistance to abrasion of the stone used in Mac-adam roads The laboratory also includes means for artificially producing those conditions and forces of a climatic character which tend to break up and destroy road surfaces

road surfaces

Now here, it seems to us, is a plan which might
very well be followed in this country by the founding of a national good roads absortator, any at Wash
ington, which might co-operate with similar but
smaller institutions provided for and controlled by
the various State legislatures. The cost of carrying on such institutions would represent but a moderate percentage of the money that is annually thrown away on the construction and so-called repair of highways by the present defective methods.

### RATIONAL STREET LIGHTING

HE proper lighting of a city is not so much a question of the total quantity of light provided as it is of the proper distribution. Because of the fact that America is the thiplace of modern electrical lilumination, and the nitry is which it was first developed on an axtendry in which it was first developed on an axtendry. country in which it was first developed on an axion-sity scale, there is a popular impression that our municipal lighting is the best in the world, yet it is a tritt that, because of the unscientific way in which we have distributed our lighting, the result-ant illumination, judged by its adaptability to the

ds of the user, in far less satisfactory than it might be, and, in its general results, is not so of ficient as the lighting of European cities. This question was recently dealt with by Dr Louis Bell

consider was recently deast with by Dr Louis Bell in a paper reach before the American Booteley of Municipal Inginovaments at its annual conventions, and the principles which he lad down are at once so obviously sound and so frequently diregarded, that they are well vortipy of careful study by the municipal authorities throughout the country. The hundamental criticism against most attempts at street lighting lies, according to the author of the paper, not so much in the illuminants used that the paper, not so much in the illuminants used that the paper is not much in the illuminants used that the paper is not much in the illuminants used that city. The fault pericularly noticeable in American cities in the lack of careful discriminantion better which domand considerable light and those which are perfectly illuminated with a less under the light and those which are perfectly illuminated with a less under the light and those which are perfectly illuminated with a less under the light and those which are perfectly illuminated with a less under the light and those which are perfectly illuminated with a less under the light and these lights are the light and light and the light and light and light and light and light and light and the light and li streets which demand considerable light and those which are perfectly illuminated with a less causity of light Most schemes of lighting aim at an approximation to uniformity of illumination over its whole area of the city, whereas, its quantity and character abould rather be determined by the particular character of the streets in which it is prized. The main thoroughtanes, in which there is considerable night traffic, should receive an amount of the contract of the streets of the considerable night traffic, should receive an amount of the contract of the considerable night traffic, about receive an amount of the contract of the c to enable the people to get about comfortably Sc also, a third class of streets, lying more remote and coming under the head of suburban roads, require ther method of illumination. Since the funds yet another method of illumination since the luminous mental purpose of lamps in the outlying, little-used streets, is to serve as markers of the way, the using of very large units, widely spaced, is obviously improper, a better way would be to employ small units located at shorter intervals.

The principal streets of American cities, according to Dr Bell, as a rule are poorly lighted, the secondary streets are lighted sometimes better and es worse than they should be, and the class usually have one lamp in every long block, which is useless, except within a comparatively short radius, for such purposes as facility to the red house or reading the address in a note book. As to the absolute amount of light required, the control of the should be red to the should be red to the streets one should everywhere have enough light to read a paper by, which is the standard of illuminate cities of Singland and continental Europe. Singland and continental Europe States is chargeable to the method commonly en the standard of the standard of the standard of the standard between the standard states is chargeable to the method commonly en large the standard of the standard between the standard way between the standard way between the class usually have one lamp in every long block,

plan is to measure the light half way between the lamps with the photometer disk held normal to the amps with the photometer disk need normal to the ray, and, naturally, the tendency of competitors for the lighting contracts is to secure the specified mini-num at as low a maximum as possible Indeed, certain types of illuminants have been deliberately specialized for the purpose of giving two-hundredths or three-hundredths of a foot-candle at a distant ree-hundredths of a foot-candle at a distant Now, if these illuminants had been designed point. Now, if these Huminanta and noon communes as they should have been, not to give a special form of Illumination, but to give the best efficiency of which they were capable, it would be possible to make then light not only widely distant parts of the street, but the whole street. While it is not desirable to attain to uniformity with a low average of able to attain to uniformity with a low average of light it is equally underlinible to concentrate the light at certain points separated by long stretches of comparative darkness Summing up, the important points to bear in mind are, first, that streets are lighted for the people to use, second, that the streets are should be lighted with reference to the particular should be lighted with reference to the particular should be lighted with reference to the particular should be lighted with the second that the streets about the second particular to the second particular to the second particular to the second particular to the lighted than is customary in the littless distort today.

## A BATTLESKIP FLRET IN BAUK OCEAN,

OR many years our Navy Department has fol-lowed the policy of concentrating an unusual-ity large percentage of the total displacement of our ships in battleships of the first class.

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Stranger is the time of a second to the passion of under his ope and immediately within reach. Principally no ship will be out to commission or pin peters, and when the resents are in the yeard for one; healing, they will have an servire A full complement of men as possible, no battleiship even being affected to paided 35 men—a torce which would be safficient to maintain the ship in condition to go into a property four hoursy notice. The large discount of the property of the p delphia, and the armored cruiser division at the

If the present plans are followed the batthaship feet in the year 1911 will be made up as follows: First Division, dasable "Connecticut." and the first readmonates "Florida." "Unit." Delawars, "Novia Dakota," and "Michigan" Second Division, the dreadmonate "Michigan" Second Division, the dreadparter of the "Connecticut" dans Trind Division, the four siture at the "Connecticut" dans. Trind Division, the four siture at the "Connecticut" dans. Trind Division, the four siture at the "Connecticut" dans. Trind Division, the four siture at the "Connecticut" dans. The division can be at the siture at the "Connecticut" class, the sister ships "Michigan" and "Micho" (armaler "Connecticut"), and the sister ships "Malon" and "Micho" for armarred crutiers division canadating of the four armored crutiers If the present plans are followed the battleship division consisting of the four armored cruisers "Tennessee," "Washington," North Carolina," and "Tonnessee, "Washington," North Carolina," and "Montana". In the year 1912 we shall have sufficient battleships to provide for a fiset in extreme enviree, constituting of twenty-ness battleships and a Reserve First of sleven of the older battleships of the first division of the active fiset was consistent on real transportation of the active fiset was consistent or of the older battleships of the first hard strength of the constitution of the older first seed to the first hard division, of the first washing "Carolina" for vision, of the first vessels of the "Coopgia" class of the Tonnessee" and "North Carolina" four abigs of the "Tonnessee" and "North Carolina"

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Our readers will recognise at once that in the above organization, ships of the same gaseral type have been assembled in the same division. The largest reason will dock at the Now York and Nor-

above organization, ships of the same gasteral type heave been assembled in the same division. The largest reasons will dock at the New York and Norfolk yards, where the largest drydocks and the best ficilities are to be found. The commander-in-clude many and the second of the same at the New York part of the same at the New York, Botton and New York, Botton, and Norfolk. So the year 1919, then, the United States may will contain thrifty-one hattleships, made up of four divisions, with four ships is sech division always will contain thrifty-one hattleships, made up of four divisions, with four ships is sech division always will contain thrifty-one hattleships, made up of four divisions, with four ships is sech division always will contain thrifty-one hattleships, made up of four divisions, with four ships is sech division sharps and the same states of the division of the same states of the division of the same states of the division of the same states will have all the ships of his division ormanders will have all the ships of his division commanders will have all the ships of his division ormanders will have all the ships of his division or same time, should the political strength the variance for each coses, each field being of considerably greater slighting strength than the buy little ships in the same of the same fine ships in independent of the position of the springly in the same of the same spine thing of the same of the same spine thing of the book most had been all the same spine thing false the same ships the same spine thing false on the same spine thing false same spine thing false same spine thing false same spine thing had been same spine thing false on the same spine thin

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York Beats hanks of the river.

It is afficially ratised that all the convention that was containly stated that all the convention that was containly stated that all the convention that contain the containly stated of the canal called for the ramowal of 101,785,000 cells repaided of material, and a few works ago the total exaction done to date under American occupancy had reached that amount. The 11,00,000 cells remarking to be excavated represent the additional work making to be excavated represent the additional work making to be excavated represent the additional work and the contained by the collargement of the canal, which was decided upon during the Roceavelt administration.

was decided upon during the Roosevelt administration. The Chandlang poverment is giving consideration to a project for a freight traffic railway to Hid-con Bay, surveys for which are now being made. As unusual feature is that the new road would have to be operated to its full appeality for about two months of the year, during the moving of the grain crop, and that for the other ten months there would be exercely e other ten months there would be a sufficient traffic to warrant operation. It is estimated that sixteen trains per day could be handled over the single-track line, and sixty-four million bushels of wheat could be delivered in thirty days' time

The battleship "Indians" has undergone some tests of the "ship brake" with which she has been equipped This device consists of a pair of steel wings, hinged to the vessel's side and normally held against the ship, which, when a quick stop is to be made, as in the case of impending collision, are released through machanism controlled from the bridge. They awing open automatically through the forward motion of the ship, and it was found that the vess to a stop within the distance of her own length without injurious shock or strain

The "Reptung" the latest of the British dread-noughts, will have, it is stated, the same length over all, 560 fest, as our own "Wyoming," but her beam will be several feet less than that of the American vessel. She will carry ten 50-caliber 12-inch guns in five She will carry ten 60-caliber 12-loch guns in five turrets, the two turrets andknip being placed diagon-ally, so as to enable all ten guns to be fired on either proadable. Her concentration of fire from her 12-loch guns will be six ahead, eight astern, and ten on the broadside, as compared with the "Wyounings" fire of four ahead, four astern, and twelve on the broadside

The United States Steel Corporation, which recently made a general increase in wages, has decided to put in force a system of pensions and disability payments for the wives and children of those killed in its employ, for the vires and children of those killed in its employ, and of disability payments for the injured. The corporation will also shortly put in force a pennion system for resperamented and disabled employer. This moreomet is to be most highly commended. In its humanitation appear, it will be a great thou to the employer and its window as a means of premotine joyalir and cheeking his growth of anarchited estimates by the other contracts.

pastruction work will shortly commence on an or of those stupendous buildings which are rapidly other of those stependous buildings which are rapidly carring for New York the right to be called a city of towers. The new structure, which is to be built as the northwest corner of Wall and Nassus Streets, on a ground plan measuring by by 17 bot, will extend by first shows the struct level, an alteration which will make it the third, tallest effect building in the world, the Matropolitan tower being 700 feet high; and the figure: tower 437 feet. The tower will be finished with a gravinated can 94 feet in height, which will be added for heiding the water tanks.

CRS is pyramined my new in means against for holding the water tanking defined to holding the water tanking free dead of the successful fields of the successful field in solid and of the caterying our, and montating igned on the fine sure is manifely, tended, copier fields to the fine sure is manifely, tended of the fine tent is manifely, tended, copier fields the manifelds of the fine tent is manifely, tended of the fine tent is manifeld to the fine tent in the fine field of the fine tent is successful field to the fine tenter in the fine field of the fine tenter is the fine of the first in the successful field to the successful field to the first in the successful field to the successful field to the successful fi

## ELECTRICITY.

a recent meeting of the Electrical Club of Chi-it was brought out that there are three thou-storage battery automobiles in Chicago. There more morage battery automobiles in Chargo. There are thirty-three storage battery installations in the city with an output of 47,000 kilowatts, while in New York the total output is 87,000 kilowatts.

An old barge has been equipped with electric weld-ing apparatus at Gothenburg, Sweden, to be used in repairing the boilers of steamers. The equipment conrepairing the botters of steamers. The equipment con-sists of a De Lawit turbine and two direct-corrent gen-erators. The current is conducted to the atomore requiring repairs by means of a pair of cables, and work can thus be sone within the botters with power generated on the bargs. The bargs is also fitted with a workshop where small repairs may be made.

An enterprising newspaper in South America in about to install a wireless telegraph system at its main office. This will be the first wireless newspaper office on the continent. The paper we refer to is La Pressa, of Buenos Ayres. This Argentine Republic is going to celebrate its hundredth anniversary with an exposition this year, which opens on May and La Preuse expects to keep in "wireless" with the exposition grounds

A Fresch inventor, M Paul Jegou, has devised an electrolytic detector which operates without the use of a battery to affect telephone receivers. The detector consists of a giase one containing at the bottom as small amount of mercury with some power (in its assultance of the content of the wire. Disuse suspanire action is used for the electronized The detector is found to act like a small battery, and yet possesses all of the sensitiveness of the electrolytic detector. One of these detectors used at Paris was found to receive signals sent from the Ouessant post on the coast.

Considerable attention has been directed of late to the effect of sunlight on the transmission of Herrian waves. A writer in Electrochemische Selfschrift, in commenting on this subject, points out that the stronger the aunahine the less the conductivity of other to the Herrians waves, so that it is incorrect to ener to the Hertailan waves, so that it is incorrect to speak of a wireless telegraph station as having any definite range, for one which has a large radius of communication in northern latitudes would have a much smaller radius in the tropics. This would be much smaller radius in the tropics. This would be particularly noticeable on vessels sailing north and south, and he suggests that it would be desirable to prepare a "radio-topographical" map, giving the rela-tive conductivity of the other at different latitudes.

A comparison of the inclosed are and the intensified are for indoor lighting was recently presented before the Minnesota Electrical Association convention. It was shown that because of the large carbons used in was move that occause of the large carbons used in the inclosed are, the carbons being half an inch in diameter, the are is spt to wander along the edge of the electrode, so that instead of giving a uniform dis-tribution of light, the light is greater on one side of the lamp than on the other With the intensified are lamp, there is no wandering of the are. The electrodes are much smaller, consisting of two upper elec-trodes are much smaller, consisting of two upper elec-trodes a quarter of an inch in diameter, and a lower one three-eighths of an inch in diameter. If the same amount of current is passed through this lamp as through the inclosed are lamp, the electrodes will be heated to a higher incandescence, thus giving a greater and steadier light.

The Board of Underwriters of Ohioago has issued the following requirements for wireless telegraph in stallations. Arrial conductor must be at least No. 3 B and 8, gage rubber-covered wire non protitous insulators on exterior of building and or knobs, cleats or in moiding in interior of building around the second ings to be used through walls, partitions and floors. Aerial conductor must be permanently and floors. Aerial conductor must be permanently and effectively grounded at all times when station is not in operation A Artial condension must be permanently and effectively grounded at all times when station is not in operation by a condensor not smaller than No. 2B. and S. gage that the second of th

### SCIENCE.

Da a recent number of the Astronom Nachr. C. Carakit calls attention to a new variable star or nova, fromed on a piate taken March 1874, 1990, at 100 dm. to 13h. Mon (Monow Insentine) The image was found in a position that was vasant on 44 previous plates, showing stars down to 135 magnitude. The stars approximate position is a = 35 mm 5s. 8 = +35 approximate positio deg 50 min (1900)

G. A. Campbell recently conducted some experin investigate the subject of teleph to investigate the subject of telephone intelligibility.

In his experiments, usually only detached syllables were employed, so as to give the listener no cine from the context. The syllables easy to inter-change are right in about half the cases. Thus while it is obvious that the telephone seriously distorts aposer wares, nevertheless, even those consonants which nearly resemble each other are not sufficiently distorted to. semble each other are not sufficiently distorted to be indistinguishable

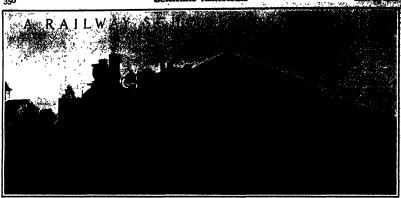
A good photometric measurement of the brightne of the nucleus of Halley's comet was obtained on April 21st by Prof Wendell at the Harvard College Observa-The measured magnitude of the nucleus was 64 The total brightness of both the nucleus and the sur rounding coma was a little above the fifth magnitude. With the approach of the moon toward the rein the sky in which the comet is found there will be very little to repay the early riser. In fact while the comet is in the eastern sky

From a study of the radio-activity at the earth saurface, made by G A Cline, it would seem that the soli contributes by far the greater proportion of the penetrating radiation present at the earth's surface at Toronto, and by comparison any that may have its source in the atmosphere or in the sun may be considered to be negligible in amount. There are no regular diurnal maxima or minima, but there are changes from day to day which seem connected with concurrent barometric changes. The conductivity is greater when the ground is baro and warm than when it is frozen and covered with snow. Filtering air through cotton-wool still leaves many suspension particies

A letter has been received from Prof E B Frost. director of the Yerkes Observatory, at Harvard Col-lege Observatory, in which Prof Frost records recent observations of Halley's comet. He found the comet observations of Halley's comet. He found the comet more conspicuous than the adjacent star Pascium, and Prof Barnard estimated the nucleus which was not stellar, to be two magnitudes fainter than this star On April 14th the comet was photographed with six minutes exposure No tail was visible with any six minutes exposure No tail was visible with an of the instruments. Visual observations of the spectrum were made by Prof Frost and Dr Sle trum were made by Fror Frost and Dr Slovin, and showed a distinct continuous spectrum from the nucleus No bright bands or lines were seen. The intensity of the continuous spectrum relative to the emission bands, has greatly changed since the comet was visible in the evening

Some idea of the enormous amount of labor required to extract radio-active substances from their ores may be gained when it is considered that to obtain two milbe gained when it is considered that to obtain two mil-ligrammes of substance containing of milligramme of polonium, it was necessary for Madame Curic and A Debi-rme to treat several tons of uranium Fairly pure helium was isolated from the gases given off pure helium was isolated from the gases given our by a solution of polonium under a high vacuum in a quarts tube, due to the action of the alpharays emitted by this element. The life of radium is about 5,300 times that of polonium (which is reduced to one-half in 140 days) The spectrum is being studied one-half in 140 days) The spectrum is being studied with a view to ascertaining if an inactive element is derived from it, polonium according to theory, being the last radio-active term in the series of derivatives from radium. The atomic weight was estimated to he shout 200

A new preparation has appeared which cleans and polishes silver, silver plate, nickel and other white metals, and which is said to produce a plating on pur-silver and any metal except gold by mere contact of silver and any motal except gold by mere contact or the preparation with the motal in view of the pub-licity given lately in British seientific journals to a similar preparation invented by Rosenberger it is in teresting to note that the American article has been known in the United States for several years although offered more prominently only since 1908 Rosenberg er's preparation requires a different modification for er's preparation requires a different modification for cach metal. The American preparation is a white, creamy liquid, perfectly stable and unaffected by light, and is claimed to be perfectly free from mercury, solds and other injurious ingredients. So far as we are able to determine, its plating action seems to be due to the affinity which the motal to be plated exerts due to the affinity which the motal to be plated exerts upon the molecules of alliers in the solution, so that the resultant plating is identical with that produced by ordinary dynamic electroplating. No electric cur-rent is necessary to produce the plating nor is an ad-dition or admixture of any other gubstance required.



Demonstration train at a way station in California.

In response to an urgent request from leading dairy interests in Southern California, Prof Leroy Anderson, head of the dairy department of the California College of Agriculture, has just made an examlation of the milk conditions in that part of the

Prof. Anderson agrs that in consultation with the datyrmen, it was devided to langurarie a good adayrmen, it was devided to langurarie a good and the referro of many conditions now undestrable in the methods of producing milk, can better be reached through the commercial aspect of the business and through the commercial aspect of the business and through the education of the producer and the counter than through drastic and radies! significant

He says that he finds the conditions under which thilk its produced about Los Angeles are not materially different from conditions in other populous centers, except that nature is possibly kinder in granting more sunshine and less rain and a more porous soil, all of

execute management of the management of the which then thought of the management of the which then thought on management of the management

In cities like Los Angeles and San Francisco, he says, where large wholesalers act as distributing agen clos between the producer and the consumer and pasteurize all the milk, some of the dangers that might result from disease of the cow and uncleanliness are obviated

"it does not have a pretty sound," continues the professor, "to say that lack of care on the part of the producers is partly the reason for the expensive pasteurisation which the wholessiers now give to milk."

"Tasteurisation, however, is one of the advance steps toward a healthier race, and some day this process will give way to such clean methods of producing milk that it will not be necessary. That is the gual toward which we are all striving."

ing "It costs money to produce clean mith, which cost must be not by a higher selling price or by more profitable cows, or both. The cow sepscialty is our mind just now, and we call the reader's attention to records taken from different bow cows vary in returns to their owners are not might be consens from similar outlay for food or seen from similar outlay for food or seen from similar outlay for food

Prof Anderson then refers to the subject of proper stables and corrais for dairy cows and says

"The great thing to be desired in either, in that hiver should be easy meaks of keeping clean and then keep these clean. This is the chief reason for using concret in stable floors. It doks not decay and then cause frou bdars, and it can bessed down with water and sweep in a few moments, so that no dirt remains. Some dairymen object to cows standing on concrete, but in California, where the cows are in only for feeding and military that some no laters.

in Casifornia, weare the cows are in only for recently and milking, they suffer no injury
"Occasionally a very good stable is constructed where the cattle stand, which portion is made of plank This works well from a sanitary point, if the planks are water-tight or are understail with a water-tight outset, and the sanitary point, if the planks are water-tight outset, and the sanitary point, if the planks are water-tight outset, and the planks cannot become saturated

monotonic activates in sheolitely essential to the production of clean milk. Milling in the certail is an abountation, either in winter or in summer. In win a shoultantion, either in winter or in summer. In win er, during the retain season, it is not uncommon to see both cow and miller wading nearly to the knees to mid, when of necessity the milk must become the depository for some of the mid.

"In summer, when the corral dust may be from one

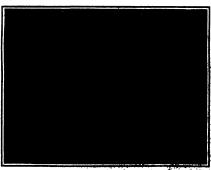
in summer, when the corrat dust may be from the tofur lacked deep, the condition is seen worse. The dust is raised with any slight breeze or with every movement of man or best, and even more dirt finds its way into the milk than during the time of rain and mud. Thus the cows must be provided with some stable which is dry and clean, and where they can be held for milking.

held for militing
"The stable needs not be expensive On the contrary, it may be very simple, and the loss humber in
it he better so long as the frame is sufficiently strong
it should permit the extrance of an abundance of
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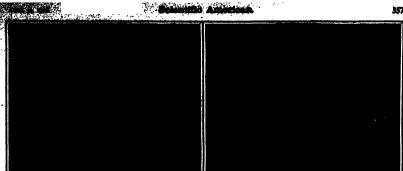
Saloi Liniment for Burns.—Saloi, 10 parts; olive oil, 60 parts; lime water, 60 parts Bread Under the Alerescope,

Bread, like mith, is one of the most general action of root, and as such is subjected to the mean frequent adulteration, and unfortunately it happens that such a fraud cannot always be detected with ease. The experts who have given sepecial attention to this lain of adulteration agree in the attendent that under the indicates of the preparation of bread the garties of the state of the water in the water cause to look darkened to the state of the water in the water is the state of the water in the water is the state of the water in the twest is taken on opercularly to clear itself, and it is then decented so carefully that creating of the state of the water in the trees the state of the water and that in it he west is that from the deposition of the bread can be accertabled.

Bread made from pure flour leaves only an imperceptible quantity of starch on the sieve. On the other hand the greater part of the gluten is found on it and



Locture in agricultural and institutional definition within a statement of the Parish and Parish an



Dairy exhibit, agricultural demonstration train. Coreal exhibit, agricultural demonstration train. A RAILWAY SCHOOL FOR PARKERS.

nts. The most resemblance to these is shown by placenta. The most resemblance to these is shown by the grains of barley, the addition of which is ascer-tained with a satisfactory degree of certainty from the precipitate on the slove A quite customary adultera-tion of bread is effected with rice flour, which always

fails to escape the scrutiny of the microscope when fails to seeape the scrutiny of the microscope wasu-this is invoked, for the grains of starch of rice are always left in great number on the sleve and are more easily recognised because during the preparation of bread they aufer less change. This result of M. Col lin's investigation is extraordinarily important, for the addition of rice flour to wheat flour or to rye flour has begun to be a veritable torment Besides, certain kinds of corn meal have been misused in the same way, though easily detected by the micro

way as is seen in the usual blades, and in this way a

way as a secen in the usual blades, and in this way a wide swath is cut under water and at any desired height above the bottom. The paddie wheel is carried on a frame which is adjustable by means of boils, so as to give the paddies any desired immersion, and the gasoline motor drives the wheel by gwaring and chain device, using two separate countershafts for this pur-

## REAPER BOAT Α

## BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

A French constructor, A Amiot, has brought out a type of boat combined with a set of cutting blades, which is designed for sen in cutting off squate growths water courses. Such operations are often becausery where the bottom of a pond or water course becomes obstructed by the thick growth of squatte plants, but where it is required to be carried out by hand above the bottom of a pond or water course becomes the bottom of a pond or water course becomes the bottom of a pond or water course becomes the bottom of a pond or water course becomes the bottom of a pond or water course become the bottom of the bottom of the course of the bottom of A French constructor, A Amiot, has broug an internal combustion motor mounted on a boat, and the motor serves to drive a set of cutting blades, which are designed somewhat after the fashion of reaper blades and adapted in their form so as to carry out the cutting of the plants under water in the best man ner The best is rather narrow, and flat bottomed being much narrowed at the front and the rear In the front is carried a paddle wheel, which is run by gasoline motor, which

Its total length is

about 20 feet.

The cutting bars are mounted at the lower end of a vertical frame, which is held at the rear end of the boat, and these extend transversely across the bottom of the frame so as to lie at a point near the bottom of the water course or pond and to cut off the plants as the boat ad-vances. Such bars are made in different longths and also at different curva-tures so as to be adapted for flat bettoms or for beds of streams of different forms and sizes. The bare are usually from 6 to 12 feet in length, and are de-signed to cut off a courid-erable area at a time. This edged to cut on a wave very constant of the present system as the present system as great derivation in the first his or correr a loss that the present system as the present system and the present system an

being swung upon the end of the lever, which is ob being awaing upon the and of the lever, which is ob-served at the upper part, and this lever is prioried in an upright. By means of the counterweight at the old of the lever, the entire frame can be raised and lowered, and this gives the adjustment of the cutting bars at any desired height in a convenient way. The gasoline motor is pisced at the other sed of the beat, and there is a belt transmission running to the rearend, which operates the pulley placed in the upper part of the cutting bar frame This does not inter fere with the raising or lowering of the frame, as will be noticed, seeing that the belting and pulk ys can work at different angles. On the shaft of the pulley is a crank which drives a rod, and this last passes down along the frame to the lower part, where it con nects with a rack and pinion movement. By means of the alternate up and down movement of the rod, and the rack and pinion at the lower part the cutting blades are given the to and fro movement in the same

pose so as to give the needed speed reduction. The gazoline motor is operated at the standard speed of 500 revolutions per minute. When it is required to take the boat into shallow water or otherwise to passe over rocks or other obstacles, the cutting frame can be lifted entirely out of the water. In this case the cutting bars are folded up along each side of the frame so as to occupy but little space the cutting is carried out at the glum It is also used on

The upper view above teaper beat is operation. The lower picture is a plan view showing

In usual practice so as to occupy but little space. In usual practice the cutting is carried out at the rate of 1½ miles an hour, and the cost of operating is estimated at 80 25 per mile, comprising gasoline, oil, labor, together with depreciation and maintenance. For cutting one acre area, the cost is figured at \$2.70 The Amiot system is meeting with great success in Europe, and it is now in use on the artificial lakes of the domain of the Institute of France, at Chantilly, and also on the domain of Lacken, belonging to the King of Bel

> a number of canals and rivers in France According to the Elec-trical Review and Western Electrician, the Park Building at Pittsburg, Pa., which is 15 stories high and contains 490 offices, was recently lighted by carbon flament lamps and had its interior decora-tions painted a deep sea green color It is now lighted by tungsten lamps, and has its interior paint ed a light buff color replacing 8,910 carbon replacing 3,910 carbon lamps (56-watt) by 780 100-watt and 200 25-watt tungsten lamps, and 21, 840 watts in 16 and 32 candle-power (arbon lamps by 8,400 watte in 40-watt and other tungsten lamps, 149 4 kilowatta is saved.

### THE REPARTOR INSTALLATION OF THE METROPOLITAN LIFE TOWER.

In the newly-completed Metropolitan Life Is In the newly-completed Metropolitan Life insurance tower is to be found an example of an installation which serves the purpose of lifting cars to an alti-tode greater than that attained in any building yet constructed Judged independently of its height. the installation is a model of modern elevator engiring Furthermore, it is significant of the st necting ruttnermore, it is significant or the success-ful development of a comparatively recent type of ele-vator machine which has been tested in actual use and found to answer the requirements of service as well as the requirements of mere height Great as the lift is the designers claim that it is possible to go even higher and that elevators can be installed in any skyscraper which the ambitious architect may yet easay As a result of this engineering achieve ment there is no difficulty in renting offices far above the city's noise and dust. No more time is consumed

or the Metropolitan Life tower, the type of ele vator selected was the Otia traction overhead machine, in which the motor and driving sheaves are situate in white the moor and driving showers are accessed directly above the hatchway. High up in the aper of this white marble campanile are to be found powerfu! electric motors, whose installation at this elevation taxed the ingenuity of the architect and engineer. They are without doubt the highest motors working in any building

thing the 44th story of the Metropolitan tow than the 12th floor of older buildings.

The problem of high rise in a tower building is one that can be solved by but few types of elevators 400 feet marks the limits of the plung A height of 400 feet marks the limits of the plunger and other hydralic machines in many forms of electrical elevators the weight of heavy moving cables or other parts, and the exact regulation of the car or load, are difficult if not impossible of attainment when certain heights are exceeded in the Otis system illustrated we have a simple machine that has been found to work with ease, safety, and reliability A motor is mounted at the top of a shaft or hoistway The armature shaft carries between its two bearings a driving sheave around which the six cables suspend ing the car are passed One end of the cables extends to the car, the other to the counterweight, which to the ear, the other to the counterweight, which moves up and down in guide rails at the side of the shaft, and is equivalent to the weight of the ear and its average load Directly below the driving sheave is ditted an idler sheave, around which the supporting cables are inlid, so that it passes again around the driving sheave with which it is in centact for two half-turns. When the current flows through the motor, the armatum rotates and moves the car up or down as desired. When the current is cut off powerful automatic shoe brakes are applied to hold the driving sheave A compensating cable in older installations a chain is connected with the bottom of the car, extends to the bottom of the shaft, passed around sheaves or pulleys, and then extends to the counterweight Its object is to compensate for the counterweight its object is to compensate for the weight of the supporting cables, whether the car is at the top or the bottom of the shaft. In other words, the system is very nearly in equilibrium, and the function of the motor is merely to move it with such additional load as is supplied by the passengers in the cars. When the Metropolitan installation was con-sidered by a board of elevator engineers it was re-alized that this system was the only one that would meet the conditions demanded in an office building meet the conditions demanded in an office building of extreme height. The thorough tests which the machines have received since their completion has justified the engineers in their selection. The Tower installation, which is quite independent

of the elevator systems serving other parts of the huge Metropolitan Building consists of six express elevators, which make no stops between the street and The cars are arranged in the cente of the tower in two banks or rows of three each, five of the six running from the 1st to the 41st floor, or a rise of 524 feet 111/4 inches. The middle car on the east bank runs from the basement to the 41st floor, while the middle car in the west bank runs from the bussment to the highest landing in the tower on the 44th floor, a distance of 586 feet 514 inches. With a live load of 2,500 pounds, or about 16 passengers, the cars can make a speed of 600 feet per minute without stops, which is the maximum permitted by the p New York Building Department regulations. New fork Building lepartment regulations. I has the journey to the top floor consumes but a few seconds under a minute which is recognized as about the limit demanded by office building renting conditions. The actual consumption of time by the passenger The actual consumption or time by the passenger does not place the tower building at any diadrantage over lower buildings, where allower speeds and frequent stops may require the same expenditure of time. In this connection it may be remarked that the traction machine illustrated can accelerate from a step to full making its from two to three seconds smoothly to full make the content of the same of the content of the content of the same to full speed in from two to three seconds m and evenly, so that the passenger experiences no un-pleasant measured in expected to travel up, and down

daily a total choices of 25 to 5 miles.

of the engineer restricting content in the process of the new content of the process of the new content of the total of machinery. rator installation was not a final finit

Mevator installation was not a final feature of the construction of the tower, but an ever-present condi-tion. As fast as the structural workers completed the tion. As that as the structural workers completed the framework, the rails for the care were set in Mass, and a temporary obvasior was rigged to send up the materials of construction. As the materials for the five machines for the elevator running to the first machines for the elevator running to the first force could be curried up by the high-rise elevator, that erection was not so different a matter When it has come monomers to raise the matchine for elevation of the case monomers to raise the materials for desirable and came necessary to raise the machine for elevator no. It up to the 64th enory, a serious problem was present. Restaully, the test was accomplished, and the huge cartings and armature were sent up to a point where they could be set in place by an ordinary tackbar of from and \$5.00 pecusia such for two elevators where devices are employed to enable extra fleavy loads, such as area, to be relaised. The magnet controllers weigh \$5.00 and \$3.00 pecusia respectively for the two classes of machines. It is here that the operation of the switches governing the motors one-controllers which are not to the controller than the controller whether are not to the controller of the switches governing the motors one-controller which are not one to the controller of the switches are noted to control of the switches are noted to control of the switches are noted to control of the switches are noted to

The motors are rated at 40 horse-power and use its voite direct current. They run at a spend of from 55 to 18 revolutions per minute, and the peripheral society of the driving sheave on the arranture shaft gives the speed of the cast. The limited space in a time of the speed of the cast. The limited space in a time of a large peripheral space in the control of the speed of the cast. The limited space is a state of the Husdon Terminal, where the traction machines can be arranged in orderly rank. In the tower one machine may have to be pinced shows the total control of the space in the controllers and other auxiliary named to the controllers must be fitted in wherever a piace offers. Consequently, the methicary round for the tower has a low without particular spaces and the space is with the controllers of the tower has a low without particular spaces and the space is with the controllers of the tower has a low without particular spaces and the space is with the controllers of the controllers of the controllers of the controllers of the space is with the controllers of the controle The motors are rated at 40 horse-pow

Around the driving sheaves pass the lifting and counterweight cables, six in number for each nichine. They are % of an inch in diameter, and ea chine. They are % of an inch in diameter, and earn cable has a breaking strength of 20,000 pounds. The length of the several cables for the various cars varies from 576 to 625 feet for the high-rise car Another important cable is that passing through the car to the eentrifugal speed governor at the top of the hatchway These are ¼-inch cables, and they vary in length from 1 144 to 1,274 feet. Their function is to transmit the otion of the car to the centrifugal gove in case of excess speed not only cuts off the power, but causes the safety device of the car to come into play and lock it firmly to the rails. The cars, which yeary and sock it minity to the rails. The cars, which vary from 9 feet 4 inches by 8 feet 4 inches to 5 feet 4 inches by 8 feet, weigh about 4,000 to 4,500 pounds each. The counterweight is slightly heavier than the empty car, so that the car is assumed to carry an aver-

In the more recent Otis traction elevators, the clanking chain used to compensate the weight of hoisting and counterweight cables has been supplanted by a special flat wire rope, which is 3% inches wide and % of an inch thick, one end being attached to the bottom of the car and the other to the bottom of the bottom of the car and the other to the bottom of the counterweight This cable passes over flat finanged sheaves, arranged in a channel-iron frame at the bottom of the shirt, which frame is carried in such a way that the sheaves are free to more up and down as the holeting poss sirethed recutrant. Two of these compensating cables are attached to each elevator, their length varying from §76 to \$400 feets. Safety no less than speed is insured for these graves elevators. Thus the speed governor already referred to serves to actuat a wedge-tung derice on the car, and to limit the speed electrically to 700 feet.

ferred to serves to actuate a wedge-clamp device an the car, and to limit the speed destrically to 700 feet per minute. If a speed of 200 feet per minute is reached, the wedge-clamp safely derice vories at once, and the car is clamped to the rails. Furthermore, each our has an emergency braite which enables the operator to shut off the power and clamp the our to the rails independently of the speed governor. At the top of the shaft, antery retarding devices cheft the speed of either car or countervalght in cases the ordinary limit of travel is exceeded.

mary innit of travel is exceeded.

Both care and countervelights land on pajanated oil
bullers at the bottom of the shaft, which bullers are
arranged on an ot otop the cure when remarking at fell
upsed, that is, under 806 feet per militabs, itsel these
have been found to work; by actual telds inseet effectivity
and matinactority.

The Ster Canal is quite a different again to day from what if was when it was opened to 100. No. Vive-Conzul Dunion gaves again fairwaiting details of how the canal like lives previous to limit the translation of the lives the contact like lives previously in little too the vive the canal like lives previously in little too the translation.

The property of the property o

The lay mind is say to consider the advances made in surgery in the last decade of more importance than those in modern medicinal practice. That this popu-lar impression is erroneous is proved by the intary lar impression is erroneous in proved by the 'inage-devices which have of late years been put to supera-ful tests to enable a physician to examine with the greatest accuracy the workings of inner organs and to restore them to their normal condition without resorting to the surgeon's kind. Notable formers, and strides in this direction have been made in the study of the dispatch organs of the busines body, seeds as examination of the stomach and its contents by the use of a bucket firmly held at the end of a fine cable and let down into the stomach, to fill and be hauled up again for examination by chemical reaction tests, nine whether the stomach digests norm abnormally, and thus to enable the physician to mose correctly the defects or diseases of the dimestive organ

goative organ
From the New York Medical Journal we learn that
Dr Max Blahorn, professor of medicine at the New
York Post-Ordinate Medical School, has succeeded in
obtaining samples of the chyme contained in: the
obtaining samples of the chyme contained in: the
obtaining samples of the chyme contained in: the
which instruments is introduced into the damodescus
which instruments is introduced into the damodescus
and the control of the chymen control of the chymen control
organization of the chymen control of the chymen control
organization of the chymen control
organizati by way of the ecophagus and stomach without alightest discomfort to the patient.

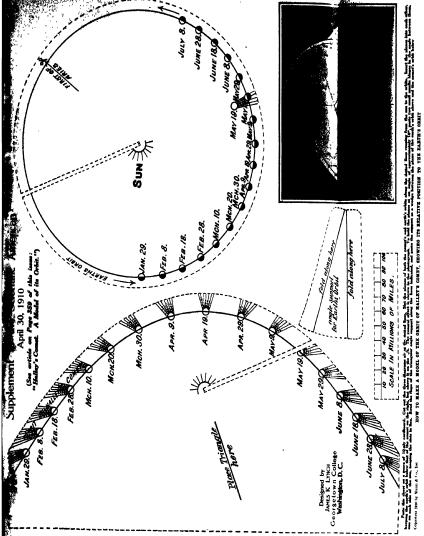
augment incompart to the patient. It is well known that primary digestion takes place in the stomach, but the most important digestive action takes place in the duodenum that is, the part into which the stomach discharges by way of the pylorus, and which also receives the very import

sylvinus, and which also receives the very important secretions from the liver (table) and the panetress. For the purpose mentioned, Dr Bilniorru user as thin facility time terminating in a small metallic perforated capsule, which is evallowed by the patient and passes into the stomach, dregging the strike the along in its descont, the tube heing sufficiently leage to extend a distance out of the patients' morth. The capsule in the stomach is acted or by the movement of the stomach wall, as the case of food. In the course of about an hour it passes by way of in the form that the distance of the priora in those through the the pyforms that the dissolation, and even as far over as the beginning of the small intestines. The outer of the tube is then connected with a small hast

the pytroid shit the sudoshims, and even as far down as the beginning of the small latestine. The outer and the the third is the consected with a small hand and the third is the consected with a small hand start of the consected with a small hand forwar, so that the disconsist contents are drawn into the perforated capsule and up through the table is not disconsisted from the tube and its contents empirical into a visid for examination. The tube and the capsule attached thereto are then withdrawn.

The inamese importance of being able to eleian, the chymn directly from the duodenum, specificly the cover part thereof, is appeared, as the physician by recover part thereof, is superart, as the physician of diagnose accurately and readily deformine these, and diagnose accurately and readily deformine these of the contents. The man instructions can of course, size by used in the sizeties, when the provided of stomach, dispersions, from beginning the end.

The successful use of the simple device de The measured use of the stunys fortys described has led Dr. Ribberts, both systems can, that is, introducing food or healtcline directly into the chain framework of the best from the chain first the sendance without first beautiful to the cellulary way of evaluation has been do expended to the chain of the chain of



Types of the second of Albertary.

The Transit Statement of Albertary.

The Transit Statement of Albertary.

I was much interest to you the letter of O II.

Suffiger of Protein, W. In your issue of April 9th constricting menophases and the disposition of weight beyon the level of the supporting planes.

It is below I write to the Wright Britishers at the lighty the level of the supporting planes.

It is below I write to the Wright Britishers of the lighty the level plane of the light of the supporting the level plane of the light of the light of the level plane of the light of the light of the possibility of the recurrence of which levels.

sugment will preclude the possibility of the recurrence of which honders, he has been been the recurrence of which honders does not no comparisons with a bird place and showing does man in comparisons with a bird place of the property of the comparison with a bird without any narrowsky motive and wis simply for the proper alternaty stated. As a pure student of available the foregone is place been been of the property of the property of the glob hope that prove will publish the same on 91 may light be outperfraessibilities. However W Mayranawa Radio Eleven, Paul.

WESSET DEPOSITION IT ATRESPATES.
To the Skitter of the Sonreverse Armsons
IF McGiner is ster in the issue of April 9th exemplifies an error out too common among people who take an interver in sercolance Flarcing the center of gravity low in an sercolance introduces many objectionals results which more than outweight is advantages. Fur from having a stabilising effect the low oppins of gravity makes the machine more unable than ower and calts for great skill on the part, of the systeet to maintain an ungight position.

avistor to maintain an upright position

This is due to the pendulum effect of the suspended
weight. When the propeller attempts to accelerate

weight. When the propeller attempts to accelerate the machine by increasing its forward thrust its restricted by the inertials due to the machines weight nearly the interest of the treather of the supporting surphese where the resistance is concentration of the supporting surphese where the resistance is of the supporting surphese where the resistance is of the supporting surphese where the resistance is of the supporting surphese where the restrict one of the treather of the supporting surphese where the restrict of the supporting surphese where the restrict of the supporting surphese supporting the suppor

This disterbing tendency is in addition to one copression of the inner wing due to its allower speed Mr McCinera analogies to natural forms have much that is good in them and like him I favor the monogame but I believe that soaring birds will be found plane but I believe that scarring birds with be tould on closer observation to keep their weight wall up on their wings. The only safe principle for an aero-plane is to have the centers of gravity thrust and support as nearly as possible coincident.

THE "SINES" IN THE HESEO S HAIR
To the Editor of the SCHRYLING AMERICAN
The texture of the hair is one of the physical varia The texture of the hair is one of the physical varieties a differentiating the nager form the Anglo-Saxon Celt or Twutonic races. But what causes the kink in the hair of the nager? For conturies and centuries the amount of the United States mayor have lived in the cause forest and heat of the torris some of Africa the atmosphere of which has been surpharged with sodium calcium magnesium supharried hybridges ammonia iron and other chemical substances. Beside these and other known natuals the atmosphere saide these and other known natuals the atmosphere sides these and other known metals the atmosphere has in twicedagases which it holds is neumenton. In the presence of these atmospheric solid and gas-ses substances coupled with a constant very "hundle the comparison of the constant very "hundle totake soulp of the indigenous native with the power-ies solid ray and heat of the toppical sun soting directly upon the head of the Homo Africanus plph as an irritant and a trauma. This certice a cognition known to the pathologist as an inflamma tion. With this condition of indiamention of the falls resultion. Enters to the pathologies as an Intianum-tion. With this condition of inflammation of the skin of the head there follows a competion and prolifers this of the bird of results of the skin of the scale pathologies, and skeak together with their convertory ducts become highest routile with their convertory ducts become highest routile with their convertory ducts become highest routile of the same as the fashed of the other high through the process the surface of the same as the state of the same and the same as the state of the same and the same as the sa

## Scientific American

The heat penerated by setten of the integraments of the skip in the present of the atmosphere tends to skip in the presence of the atmosphere tends to on the outer cheeth of the hair and gives to it

its permanent character.

In the immersta some of the United States where
the humidity of the atmosphere is not so dense with
our abundance of stidlight where the atmosphere is
not so heavily impregnated with metallic corpuscles and gaseous substances and where the Afro-American s head and scalp are protected by the ordinary head and gascous substances and where the Afro-American hand and each are protected by the ordinary hand gaz reserved also from beneath the direct rays of the turred proposal sum the stilledgated factors which have been appeared to the stilledgate factors which have substantially as the stilledgate factors which have each of the stilledgate factors which have each of the stilledgate factors and the stilledgate factors are factors or factors and the stilledgate factors are factors and the stilledgate factors are substantially as the stilledgate factors are no offshoot factors and stilledgate factors are substantially as the stilledgate factors are substantially as the stilledgate factors and the stilledgate factors 1884 p 34 who mays Thus white races of Europe and these particular substantial factors are the whole of Europe and America are therefore of a near or origin and the same causes and elements of matter that here for the same causes and elements of matter that here for the same causes and elements of matter that here deplemented the skin and straightneed the hair of frequents at his and its appear. Homo Cancasicus will in time produce the sam results in the Afro-American's skin and its appen-ages J M Bosov ages St. Paul, Minn

## HALLEY'S COMET -A MODEL OF ITS CERIT.

For the large number of people now interested in the famous Halleys comet who have found difficulty in obtaining an intelligent idea of its motion in space its apparent motion in the sky and the times of its visibility a cardboard railof model like that of which a photograph is berewith reproduced will be of great amistance And even those who already understand the phenomena from the study of plane diagrams may obtain a much clearer idea of them from the model because it is much more concrete and represents the sun and the orbits of the comet and the earth as they really exist in space and not as they are often shown

y being projected on the same plane
In order that the readers of the Scirntino Ampai in order that the reacess of the SCHPHTHO ARFAI can may easily construct such a model for themselves patterns or diagrams are printed on the accompany ing loose-leaf supplement which when pasted on card board cut out and properly fitted together will make an excellent model

After telling how to construct the model so

scription will be given explaining how the astronomical phenomena may be studied from it

Having first pasted the loose-leaf on a sheet of card
board about 10-pty cut out the three diagrams along
the dotted lines Also cut a narrow slot through the planes of both the comets and earthy siot through the planes marked. Then insert the planes into each other as far as the alets will allow keeping the earth s orbit below that of the comet on the right but above it on the left.

If the two planes are correctly fitted together they will now produce the general effect shown in the pho-tograph. But besides having the model rigid the two planes must be given the necessary inclination to each

planes must be given the necessary inclination to each other of approximately 18 degrees. Fasten the two planes together by pasting two enails mustals higges in the angle between them one on each side of the sun keeping the shots in line. Then bend ing over the flaps of the triangle along the two lines matted on it pasts it as a wedge between the plane of the earth a orbit above and the comets below. This

impletes the model

The reader will observe that the comets position is indicated at intervals of ten days before and after perihelion as it travels in its orbit in the direction of the arrows. The earth s position as it yearly moves about the sun in the opposite direction is also shown for the same days. The printed side of the model

Examining the comets path in space we see that

Examining the counts path in more we see that it cats through the plane of the ellottic at the according node symbol & in Assuary On April 19th it was at perhelic On May 18th 19th it cuts through the plane of the eclipte at the descending node. During the early part of the year the cenus and the sarrh spored on roughly parallel lines. Hence the counts givey brighter only by a change is its intrinsic facilitatory. Now however the orbits are rounding in the threat side other and the counts will be more conspiguous became it is approaching the earth 7ths tail is always directed sway from the son Happe in March it was much foreshorized for us fixed it is the bright of the proposed that is the country of the son that is the same than the same than the same that the same than the s

The time of visibility of the comet will depend on whether it is to the left or right of the sun as seen from the earth To transfer correctly to the sky left and right on the model we should imagine the sun on the meridian at noon with the comet to the left or on the merician at poon with the connect to the left or right. Taking the way that common observation shows the sun to move across the sky from east to west on account of the earth a fally rotation it is easy to see that any body that is to the left of the sun at noon will rise and set later than the sun and anything to the right at noon will rise and set earlier than the sun

than the sun Hence before March 25th the comet being to the left of the sun rose in daylight but set after the sun and was visible in the evaning At present it is to the right of the sun and rises before it in the mora ing increasing its distance until May 8th when it reaches its greatest western elongation. It then ap-proaches the sun and comes into inferior conjunction on May 18th 19th

As the three colestial bodies are also in the same plane on this date the circumstance makes it possible for us to go through the comets tail if it is long emough to reach us What we shall see on that night it is not the purpose of the present article to con sider but it may be said that as the moon is then sching full a fact which has been some

overlooked we may not see anything at all The comet and the earth are fourteen million miles distant May 18th 18th but their closest approach on curs a day later when they are thirteen million miles apart The closest approach of the orbits is at a point a little below to the left where the counts orbit is six and one half million miles below the earth s On diagrams where both orbits are projected on one plane they apparently intersect at this point Hence some people have imagined a possible collision here but the orbits never intersect as the mod-

On and after May 20th as the omet is to the left f the sun in the model it will again be visible in the western sky being seen as soon as it is dark enough and setting about two hours after sunset which time will gradually increase 1 four hours by which time will gradually increase to four hours by the end of May. But as the two lodies are then re-ceding in almost opposite directions and the tail is turning more and more away from us the glory of Halley's comet will soon be lost to us for three-quar tors of a entury

## The (urrent Supplement

The current Rappiement
The new 60 it in nich ting tel a ope of the Mount
Wilson Solar Observatry has be n in op rath nor
solutione year. A d night in of this wonderful in
strument and the work which it does in presented
in the current is stryrayaray. No. 191 by 7. A bash
Swen Hedina big Trans Himalaya is reviewed Hail
bey was not only the first to predict the rel rine of a
comet but take to devise a method of determining
the age of the ocean from chemi al deputation George
the age of the ocean from chemi al deputation George F Becker con ments on his work. The ancient deci-mal bead france is still in actual use side by side with the very latest adding and listing machines. This ancient head fram the Chinese abscus and its Japan ese twin brother are described by Mr Daniel Arthur ees win brother are dawned on ym Daniel artuur Dr Jam Charcot pres nis th results of his Antartic exception Henry A Wise Wood contributes an exception paper on Mod rn 'stereotyj y and the Mechanics of the Newspaper shitted with must undoutedly at the state of the transfer of the proper with proper with the contribute of the proper without the contribute of the proper without the contribute of the proper without the proper of the proper of the property without the proper of the property without the property of the pro is the trive of an active with most should rely as tract attention be ause of the present rubber boom Under the title Mechanical Oddities some cirl is in ventions are described. The design of a roplane motors is discussed. A Melin suggests an improvement in aeroplanes. A box with a secret of hing is dein aeroplanes A box scribed and illustrated

## Mercury Are Patents Granted

After six years nest Mr Peter Cooper Hewitt has been awarded patents for his mercury vapor elec-tric lamp. The patents have been in interference st since the date when they were first as piled for 01 Mr Hewitt's chief opponent was the General in 1901

In accordance with the recent decision affecting th classification of articles under the Lariff Act of 1909 the United States Treasury Department has instructed customs officers to admit free of duty all miners safety lamis whether elatric or designed for usi oils or other illuminating materials with or withou oils or other illuminating materials with or without giasa chimneys and whother imported as an entirety or in separate parts together with any apparatus for locking or unbotching such astrol; lamps for testing or desecting naws in these lamps or for desaning them of dust particles et together with all mir a rescu-appliance and parts thereof such as bein it specific tubing of vilves special oxygen sylini in offiling oxygen pumps and all other essential parts of the complete putilt, whether imported as entireties or is

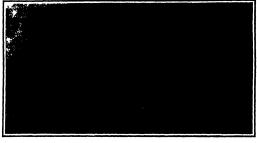
# MOTOR-BOAT RACES AT MONACO THE

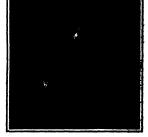
BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

The motor best races at Monaco at The moor bout races at means a an about. Carlo this y as we notworthy on account of the extremely high up of a bith was attained according to the cable dispatches. There were a score or more of beats in the races which were tavored with excellent weather

and a half astonished many of the speciators, and was an excellent testimental to the design and con struction of the Wobselry-Siddelsy motors that drave her She was piloted by her owner who steemed her with great steadiness. He took the turns with-

gree of accuracy is obtained, and an experience has shown that in a long-distince race a lengt will make the support of anything, thus in a short speed trial, it seems certain that the Ursula' has not shown much more than 46 miles as hown so far That she should





Three of the centestants making a turn in the "Championship of the Sea" race

Stern of the "Ursula," showing radder and twin sore

that made possible the attainment of great speed sp-inity in the long-distance events. The flust long-distance revents the flust long-distance race for the Championship of the flew was held on Sunday April 10th Count of Purviates Coorcive resulty were this 10th-disenter (144-mile) race in 4 hours 28 minutes 45 % 5 sec. code at a speed of 281 miles per hour Out of the 28 competiture in this long distance race for cruisers the Tel-Morra Calpuso Gregoriev VIII and Spagal linati finished in the order given 11 ne was an exciting one assevani of the boats

ii in e was an exciting one as several of the boats were quits evenly matched. The Brasier Despujois hydi plans which was one of the novel craft that iscal this year did very well and showed good speed in projection to its horse-power. In the second great in proportion to its horse-power. In the second greated international rev. for the Coupe des Nations which tooks place on April 12th this book was second final place on April 12th this book was second final place on the complete of the 100 kilometers (821 miles) in 1 hour 2 de minutes 80 25 seconds 25 miles) in 1 hour 2 de minutes 80 25 seconds 428 miles an hour of the Urrusia. She was final revealed with a Breater 4-cylindow-negation of 100 horse-power with the 100 horse-power with the 100 horse-power with the 100 horse-power with the 100 horse-power hourse-power. One of our photographs shows the twin acress of the Urrusia. Her capture are arranged side by side one on each side of the built Another photographs shows the Urrusia at 111 mg and while a latired it ture shows the Brauter buil Another photograph shows the Ursula at Juli n, vd. while a third it ture shows th Brasier Despuisle The difference in the amount of spray thrown by these two beats is interesting the former cuts through the water with very little disturbance while the latter shims over it with a good deal of spisating Tu, guart; sufarity with which the Ur-sula speeded around the course for nearly an hour

out slowing down and at each turn the boat would tip dangerously. The Ursula showed herself to be one of the fastest motor boats that have ever been built but in the mile and kilometer speed trials she did not make anything like the time that rams me cut not make anything like the time that she is reported to have accomplished in the long distance races in fact the hydroplane beat her in the speed trials owing to its ability to get under way quicker. The times of the mile from a standing start and of the flying kilometer trials by the Brazier Do-pujois and the Ursulia were as follows

|                   | Mile     | Kilometer         | Miles<br>an Hour |
|-------------------|----------|-------------------|------------------|
| Braster Despujols | 2 20     |                   | 35 71            |
| Brasier-Despujois |          | 50 2-5 sec        | 44 25            |
| Ursula            | 2 36 2-5 |                   | 20 00            |
| Ursula            |          | 55 <b>2 5 sec</b> | 40 80            |

The Ursula this year is fitted with the same two 12-cylinder Wolseley Siddeley motors that were used last year. As her best speed then was about 37 miles per hour it is fair to assume that the figures given in the cabled reports are not correct or else that the distances around the course were less than supposed it is extremely doubtful if the Duke of Westminsters racer averaged more than this figure in the long races especially since she made only 40 35 in the long twee especially since see misus only we on miles an hour in the flying kilometer speed trial We understand that on account of the great depth of the water where the races are held there is often times a shifting of the buoys owing to the inclining of the anchor lines and that this causes a shorten ing of the course. The mile and kilometer tests are therefore the only ones in which any great de have averaged 48 miles an hour with the same power plant as heretofore is very creditable

# An Aeroplane Flight with Five Pure Cross-Country Flying in France

One of the most remarkable performances ever made rith an aeroplane was that of Roger Sommers new with an aeroplane was that of Roger Sommers nev biplane last week in France when piloted by its own structor it carried him and four other persons in a five-minute cross country flight. On this occasion the aeropiane lifted some 750 pounds of dead weight probably a total weight of 1 800 pounds with pres

probably a total weight of \$100 pounds with presuma-bly a 60-face power implor

\$\frac{1}{2}\text{polymorphisms}\$ prover implor

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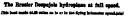
\$\frac{1}{2}

across country with a passenger

These brilliant flights form an occilar demonstration
of the great advance recently made in dynamic flight
and point the way to the practical utilisation of the
seroplane for the transportation of individuals and

The Electrical World states that at a re The Riccircal world states that at a recent minery convention in Isdianapolis the opposition of mine workers to electric power the introduction of which they consider against their interests was manifested in a resolution declaring that the use of electricity in mines is hazardous as the leakage from poorly insu-lated wires has a tendency to ignite mine gases and frequently causes explosions







The Duke of Westmanter's "Unsule" speeding in H the M.Louis Coupe day Marigas may 1967 by the coup of the coupe of the

# THE MANUFACTURE OF CELLULOID

BY JACOUES BOYER

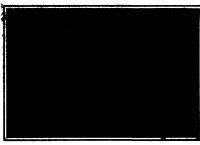
since than sixty years ago chemists began the search ver substances of which initiations of horn tortone shell, and ivery could be made One of the first best, and ivery could be made One of the first perspective. The Plearon of New Orleans turnished a theoretical solution of the problem in 1848 the discovery of ceilcield a complex substance comissis go shelly of introcellulous and campher but not injustified application of celluloid was made until a punch later date in 1848 Parkses of Birmingham obtained a stimilar punkances which he named parketsine by mixing susception with wood applich a The hardeness of parke-single limited its applications and it was employed philely as an electrical insulator. In order to soften

it caster oil was added to the mixture and afterward the naphtha was replaced by methyl alcohol Parket size obtained a temperary sources in Ringiand by the old the manufacture of which was begun by the old the manufacture of which was begun by the Other large collucid factories were subsequently can chilabed in America Prance England and Germany Celluciod is now made from a very pure form of cellulone usually obtained from cotton or unstead fit for paper. The cellulone is converted into attrovellin loss by methods which vary somewhat in different fac-tos by methods which vary somewhat in different fac-tos by methods which vary somewhat in offerent fac-tors that the collusion of the collusion of the collusion of the following. The material—raw or spun cotton or

paper chopped or cut into stripe—is immersed in nitre acid for a period ranging from fittee in utes to two hours scoreling to the chara ter of it in the man of the compensure of the character of its fitter of the compensure of the substrate is taken out wrung and present for remove most of the substrate justice which may or many not her returned to the iterating which may or many not her returned to the iterating which is not the returned to the iterating which is not the compensure of the substrate of the substrate of the compensure of the substrate of the compensure of the compen

nitric acid

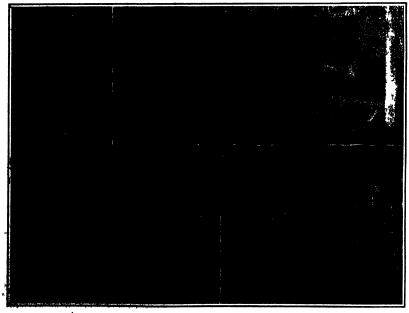
The nitrice/clulose is washed in water and ground in
a paper mill in which a rotary movement is impressed
upon the mass as it is forced between a pia a d two
cylinders which rotate at a speed of 180 revolutions



Hending collulated haltpine.



Blowing celluloid della.



's Similar in the segrence

Rolling shoots of collulatel. THE PARTMENTAL OF CHILDREN

Cutting out cellul id rods.

Selection Action

per minute. The cylinders are set with steel blades, parallel to the axis, and the plate bears a number of steel blades, slightly inclined to those of the cylin dors The finely ground nitrocellulose next goes to the bleachery, where it is treated with chlorine, hydrothe bleachery, where it is treated with chlorine, hydro-gen dioxide sulphurous acid, potassium permanganate and other decolorizing agents. It is then washed thoroughly, pressed between rollers, and dried ('cilculoid is made by dissolving nitrocelluloss in an

alcoholic solution of camphor Bome mix the camphor with the moist produ Some manufacturers presses which contains 40 per cent of water, while others add the camphor to the dried nitrocellulese in the former case the moist pulp, camphor and colorand in the control of the money of the many campaor and control of the many campaor and ca crushed by rubbing the pulp, with the hand ough a coarse wire screen

Drying is effected indirectly by pressing the pulp between layers of absorbent material. The pulp is spread on a cloth which is turned up over it, forming spread on a cloth which is turned up over it, forming a rectangular cake 24 inches long 20 inches wide, and about % inch thick. In the factory of the Société Industrielle du Celluloid these cakes are piled alternately with dry feits a sheet of iron boing introduced

after each ten or fifteen cakes, in order to facilitate handling. The pile is then sub-jected to a hydraulic pressure of about 250 jetted to a hydraulic pressure of about 250 tons. After a few minutes of this violent compression, the new wet felts are replaced by dry felts and the operation is repeated until the nitrocellulous is dry. The compressed eakes are new unwrapped and bucken into fragments for solution. If the campinor has been added before drying the habour lates a feet and the complete of the campinor has been added before drying the broken cakes are simply sprinkled with al cohel, but if the dried nitrocollulose contains no camphor it is moistened with a solution of 90 parts by weight of camphor in 100 parts of alcohol

The solvent is allowed to act for 24 hours and then the mass is rolled between hollow iron cylinders, from 12 to 26 inches in di ameter, which make 10 revolutions per min ameer, which make to revolutions per init ute, and are cooled or hested, as desired by a circulation of cold water or steam in their interior. From 65 to 130 pounds of celluiold are rolled at a time the rolling being continued from half an hour to several hours. Toward the end of the operation the cylinders are brought close togother in order to produce a thin sheet of celluloid longer and wider than the press by which the sheets are converted into The rolled she ets are trimmed the exact dimensions of the press, and the trimmings go back to the rolling mill In the Champigneul block press a strong

iron box 54 inches long, 26 inches wide and 12 inches high is filled with sheets of cellu-12 inches augn is mined with sheets of ceiti-loid and those are converted into a single block by pressing between two iron plates. The top prate is fixed in position, while the bottom plate is carried by a plunger which oners a cylinder below and is forced upward by hydraulic pressure A pressure of 250 tons is applied for a period varying

of 259 (one is applied for a period varying from 5 to 1.1 bourn, during which the ceilu loid is kept at temperature of from 156 to 1.9 deg. Py a circulation for 156 to water in the interfer of the plates and the double waits of the box. The mass is coded by substituting cold for hel water the pressure being continued during the cooling. The top plate is ther removed and the block of ceiluluid is forced out of the top of the form of the pressure forms being continued during the color of the pressure forms the continued during the color of the pressure forms the continued during the color of the pressure forms the color of the color of

The blocks are cut into bands or rods according to be purpose for which the colluloid is to be used The bands are cut by a machine in which a knife, the edge of which is inclined 40 degrees to the hor zontal, is forced downward by a screw In this way bands varying in thickness from 1/250 inch to 14/2 inch can be obtained. Celluloid is cut into rods or libers by a machine in which the cutting tool has the form of a whost cylinder of diameter varying accord ing to the size of red desired

The celluloid, after it is cut up is dried in cham the centilion, after it is call in direct increase bera where the temperature is never allowed to exceed 111 deg F on account of the danger of explosion. The time required for desiceation varies
greatly with the thickness of the bands or reds Bands
thinner than 1 100 inch dry in a few hours while strips thick enough to be used in making knife han dies, for example must remain in the drying cham her about six months.

Tubes of celluloid are made directly from the rolls sheers in an apparatus which comprises two vertical cylinders, with their axes in the same line and their pistons connected by a cross red. The bettern of the lower cylinder has a central critics, to which ass apertures of various dimensions can be adjusted, the lower part of the cylinder is heated by a cir tion of hot water. The calluidd is introduced like this cylinder and hydraulic pressure is applied by means of the cylinder above. The calluidd, settlened by the heat, is thus forced through the aperture is the form of a tube, which the operator draws away and cuts into convenient lengths by means of a champ of hot wate

attached to a cord passing over reversible pultays.

To return to the bands of calluloid which have bee To return to the bands of calluloid which have been cut from the pressed blocks. In the drying chambers these bands become warped. They are fistioned in a hydraulic polishing press which exerts a pressure of about 1,000 tons. The celluloid bands are pile nately with sheets of polished brass or nicks steel, a thick plate of cast iron covered with cloth or felt being inserted after each four or five bands. These felt being inserted after each four or five hands. Thus iron plates contain channels for the circulation of steam or cold water. While the presentre is applied of F for a few minutes and are then cooled by cold water. When the hands are taken from the pro-ting of the plate are found to have acquired the high points of they are found to have acquired the high points of they are found to have acquired the high points of the plate of the plate and the plate of high plate of the plate of the plate of high plate of the plate of high high plate of high plate high plate of hig sheets of metal which were in contact with them.

Before describing the subsequent transforms, the bands reds and tubes of celluloid, the method producing striped, veined, and marbled effects should

Plattening celluloid hands that have warned in drying. THE MANUFACTURE OF CELLULOID.

be noted. For this purpose two blocks of celluloid of different colors are made separately in the block press and cut into bands about 1/100 inch thick. A pile of these bands, arranged in alternating colors, is sliced with a powerful paper knife. The fine strips of cells who a powerful spec failt. The sine stript of ceirs iold of two colors resulting from this separatica ar-arranged regularly or irregularly in the block press and converted into a solid block of striped; related marbled or "watered" appearance From the bands, rods and tubes of plats and varie

artic civiliane, objects of every form and character gated civiliane, objects of every form and character presenting the appearance of your, tortokes shell, ma-heapsy and other woods, cords, amber, jade, mak-chite, allken tabrics, etc., are made by variess objects tions, of which the most important are shapine, on tions of which the most important are shapine, on ting out moiding, curring, blowing, variessining as decorating

Colluidd, like wood, hore and proor, is measily should be hand, with the cheek, drywing knick, resp. etc. Colluidd hair pins are pointed, so the case wheel Shanjan is door also of the laster in high school of the cheek in high pinter of the Società Insurptiple sp. helysaid. After thing out is door prevenight by magnific, After pinters, threater and hand gave, and coulding After pinters, threater and lead gave, and could be specified by the formation of the complete of the complete of the complete of the contract of the c Calluiold, like wood, horn and tvory, is u

tietty which definited acquires our wears.

Callisted beits piles, too cannoise, and tenish
water, best by least on a michal form tast
coad by beiting allested take gold water,
totan must be improvinged with spill and or
tions must be improvinged with spill and or
tions must be improved with spill and
ledd becomes which and opaque when

strongly. Collusied objects of the utmost variety of the professod by medding, in which operation the set influence of healt is eaght utilities. The object, ansately shaped by other methods, is inserted in the two segments of a breass most, which are not with the heated plates of a steady great, the celluloid has become sufficiently plattin, the are toront operatory of a collision are set of collisions.

we through together, and the ceithode securing he are through the mild, which it vestions afthe ceiting. Leaves, points of flowers, and similar small this absence of ceitical are shaped by teamping with died. The operation of hibbings is performed on ceitished these as they are drawn from the years. A twice of milds definementous is placed in a heated mod general process of two or more segments and, when said, is the finited by a higher of high pressure seems which farces to the ceiting of the ce

other toys are made. The parts of splight-boase and other butties objects, are pass-times joined by means of scatons, soul-acid or other solvents of celluloid. Chas-boxes are varnished with a solution of cell-loid in south acid, which saves polishin

with pussion stone.

For decorating the surface of cellulaid antiline colors dissolved in alcohol are em Air Bosistance Experi

A useful critical comparison of the work of Frank and Effet is presented by W. Schule in the Zeitschrift des Vereines Schule in the Zeitschrift des Verstädes Deutsch ing The law that realization in proportionate to the square of the velocity has been versided by Frank for valodities up to 6 m./mc. and by Billel from 15 to 6 m./mc. and by Billel from 15 to 6 m./mc. and the proportional to the normal area, and this restatate does not read in fastiantom with an area of 1 as, m (Billel). The results are series of 1 pt. m (Billel). The results of Prank for right direction printers and of Prank for right direction printers and comes of various angles are in contradiction to those of Eiffel The error is considered to be on the side of Eiffel, and further, the resistance deduced by the latter from his experiments with inclined plates requires substantial correction. The resistance of an

resistance deduced by the latter from his caperimums with inclined plates requires minimum and inclined plates requires minimum for the contraction. The variations of an the inclination of the plates up to 10 day, and "much more alovely thereafter." Frank-coefficient for the surface friction of plates moving parallel to their freezint plates and plate in moving parallel to their freezint plates and plate in the surface freezint plates and plate in the surface freezint plates in the supplier freezint plates inclinated at 50 deg. to 20 deg., the algorithm freezint plates inclinated at 50 deg. to 20 deg., the algorithm freezint plates inclinated at 50 deg. to 20 deg., the algorithm freezint plates and the surface of the property of the unit of surface, prophetics, pleases through a surface plate of the plate of the

Chillock with organic for games and construction of the best pictures of



ECHICOPS LENGTS AND HOW TO THAT THEM.

The arrival of Halley's comet and the interesting us servine to manage comet and the interesting ages in the appearance noticed by the keen-syed signmen using a powerful telescope have naturally sed the paintitated to inquire into the use of these mea, and to wonder how much their cres could if a talescope were put at their disposal. Certain



For Lawrence OF A LEGS.

it is that the first look through a large telescope would be disappointing, for nothing appears as hig or an magnitude accepated. The beginner is apt to be-jieve that be chold use the whole moon at once and art onty a few miles sway, but is annased to find he has see only a small perion of it and that shimmer-ing and dancing in a purple hase. It on my admit the beauty of the color not knowing that this is caused for the color not knowing that this is caused for the color of the color of the color of the fortunately he got rid of. Indeed, the moon presents a prettier plotter in a three- or four-inch telescope of explaining the simple things about a telescope that this article is unytitude. this article is written.

this article is written.
It is sometimes thought that a telescope is powerful because the rays of light pass through a largo number of lenses placed at intervals down the tube This idea, like many another popular one, is entirely erroscous. The talescope set its power mainly from the objective which causes the rays of light conting Selfentheological under observation to converge, and if not intercepted form an image

not intercepted form an image,
"The action of a simple lens is easily understood.
If parallel rays of light fall on the lens in the same
direction as the axis of the lens they will (Fig. 1)
converge to a point F, called the principal focus, and
similarly, rays from F will emerge as a parallel beam. F may be on either side of the lens, and it is in



-PORMATION OF AN INVESTED IMAGE.

terial in which direction the light goes through The distance from F to the tens is the focal length. Next, if we have a parallel beam not in the direction of the axis (Fig. 3). It will likewise converge to a point, different from F II we neglect the thickness of the leng, a ray through the conter of the lens of will pass through most residence, any far through T the from will ensure purallel to the sain. Rays from the north of the moon, Y will be brought as of focus at m. and of the moon, Y will be brought as of focus at a man of the moon, Y will be brought as of period at the most of the period there agreemed see for a photographic pile we would obtain a picture of the moon. This image is inappried.

would obtain a picture of the moon Tale image is incepted. There different ways of using the convergent penuli of right from the object glass give time different kinds of talescopies. If the curve before they came to collect on the collection of the collection of

# Librille American

respons are pixtud rays falling on the middle of a sim-ple lens are brought to a forms at a different point from those falling on the edge of the lens, as is shown in Fig. 5. The distance from F to G gives the amount of the "apherical abstration." Even more



Fig. S.—SPHERICAL ANDREATION.

ges had a great amount of color so star images had a great amount of color surrouncing them. A less may be regarded as a round prism Since a prism not only deviates light but breaks it up into the spectrum colors, a simple less will act as is shown in Fig. 4, the violet light in most re-fracted and is brought to a focus at v, the less refrangible red comes to a focus at R, with rays of other colors in between these two extremes. The reother colors in between these two extremes. The re-sult of all this is that if we focus for the yellow, the red and violet form rings around this and a star image is aurrounded with a considerable amount of color Bir issue Newton was the first to explain these color Bir Isaac Newton was the first to explain these sherrations, and it is singuist that although he made experiments to prove that giass and water disperse tight differently, he did not forestail Dollard's discovery (180 years ago) of making an objective from a combination of two lenses, one a double context lens of graving glass, the other a double concave lens of graving glass, the other a double concave lens of fint slees.

filmt game.

With such a combination the optician has four sur-faces to figure, and as a result it is possible to almost entirely eliminate the spherical aberration, or in others words make a flat field. But on the other hand it is still impossible to get entirely rid of color Flint

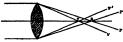


Fig 4 -CHROMATIC ARRESTATION.

and crown glass do not disperse light alike, the fiint relatively gidens out the violet and the more. The optician with glass of two different sorts at his disposal can bring two colors of the spectrum to a sharp focus For a visual telescope the rays generally taken are the yellow and the blue green Consequently both red and the violet ends of the spectrum are not in sharp focus, and these form rings about the stel-lar image which combine to make purple color. In small telescopes this color is not so pronounced, but

small tolescopes this color is not so pronounced, but with large telescopes of 34 inches or more specture the color is complexous and cannot be got rid of This is known as the "secondary spectrum". The problem of making a good visual lone is really a much simpler one than that of making a good photo-graphic cas. In the first place, in the ordinary tele-scope for visual purposes, the field is comparatively readl, of only a few minutes of are, and the process of making a feed fist over the area is simple com pared with that required in an instrument like the Bruce photographic telescope of the Toreke Observa-Bruce photographic telescope of the Yewkes Observa-tory, which photographs an area in the sky 16 deg square. With refracting telescopes the ratio of aper-ture to focal length is about in the ratio of 1 15 (the Yerkes 40-inch has a focal length of about 750 inches, a ratio of nearly 1, 18). In a photographic telescope, of nearly 1 . 19). In a photo



Fig. 5.—COMBINATIONS OF LENGTS FOR RAPID PROTOGRAPHIC WORK.

for the portrayal of a comet, for instance, as short expansus an possible are desired, and this calls for me great a ratio of appearue to food length as been in the company of the company of the company of a ratio of appearure to feed length of 1 16 the lens is opened to 1 :8 the photograph is not so sharp. Only lenses of the best makes can be used at 1.5. (Fig. 5.) liveryone who is familiar with the tage of a cignose, known how much sharpes a picture is adjusted by religious of the company of the company of the religious to the company of the company of

field from a lens with an aperture of 1 5 is impossible with only two lenses; three or more are necessary Using glass of different indices of refraction which is possible from the fine qualities of Jenz glass now procurable, separating the lenses properly and now procurance, separating the interest properly and grinding their surfaces to the right curves, it is po-sible to obtain a flat field with an absence of color and astigmatism. (Fig 4.) The Bruce photographic tele-scope has an aporture of 10 inches with focus 50 inches It is a 4-lens combination, technically known

Every skillful amateur knows how to test a photographic lens. This is perhaps done as well as any other way by the test cards for astigmatism, to see

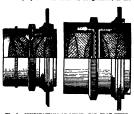


Fig 6 -- COMBINATIONS OF LENGES FOR FLAT FIELD AND ABBRICE OF COLOR.

if straight lines which intersect at right angles become lines or blurred images at the edge of the field. come lines or blurred images at the edge of the results for Still a lens might answer all the requirements for ordinary camera work but be a poor astronomical lens.

A camera might cut clear to the edge of the plate A camera mignt cut clear to the edge of the plain on ordinary work, but when a three or four-hour ex-posure is given on stars all imperfections will show up Unfortunately, for obtaining astronomical photo-graphs a telescope mounting with a good driving clock is indispensable—which is usually out of the reach of most amateurs

On the other hand there are a number of small vis ual telescopes in the hands of amateurs, and a few words night be said in regard to testing them This is best done on a moderately bright star. Forus car-fully on it. Push the eyeplece in slowly and note the change in appearance. If the spot of light does not rully on it I rush, the cycpiece in slowly and note the change in appearance I it he spot of light does not remain circular, the objective is not "squared or properly, or the objective may be pinched in its cell This must be adjusted before anything more is done Now pushing the eveniers in, the colors should



7 —WORE OF A RECTILINEAR LENS COMPARED WITE AN AWASTIGNAT BLURRING DUE TO ASTIGNATION IN RECTILINEAR LENS.

change gradually and symmetrically as the disk of light enlarges. The same should hold true by pull ing the expelce outside the focus. If the telescope behaves well from this test, turn to a double star like Castor. As the ameteur becomes familiar with the heavens, he will soon learn text objects for his telescope, and if he possesses a good instrument there is no keener pleasure than trying it night after night and becoming familiar with the beauties of the heav-

POWDER PLATING OF METALS. a mreting of the Royal Society of Arts, in Before a me London last January, a paper was read on an im-proved method of electro-plating. It described the process of plating metals by rubbing them with a moistened powder, and a number of articles were plated with gold silver and sine before the society. plated with gold suiver and sinc nerors the society. The new plating powders are not to be confused with plating preparations which have been in use heretofore and which act merely to exchange the surface metal of the article to be plated with a thin film of depos ited metal. In the new process a truly electroly-ic action takes place which results in the deposit of metal without taking away the surface metal from the object to be coated Furthermore the deposit may be made as thick as desired by continued applications The inventor of this plating powder of the powder of the powder and inventor of this plants; powder began his experiments a number of years ago with a view to developing a process by which kniven forks spoons and the like can be plated as rendily as they can be cleaned with polishing powders, and he succeed in deviating a workled by which almost any metal and even certain alloys such as brass in various proportions of copper and sine can be applied to metal objects. So far the new powders are not on the mar-ket in this country but in England they are sold in

need in this country but in Engiano they are sone manil cans for a shilling each and one can is suffi-cient to plate the Effekild portions of a bitycle or to plate a quantity of house lod silverware. The powders are composed (1) of the metal to be deposited in its of mentary state (2) of a sait pre-frably a sait of ammonia and (3) of a powdered f rably a sait of ammonis and (3) of a powdered metal which must be let propositive to the metal which is to be d posited. Magnesium is the most hetro positive metal with bit is commercially prac-tical to use and in naw of the preparations this forms is a tive in all i ment in some of the prap-arations aluminium and sine are used. The follow into formula activate his size platting powder

| /lac              | I' parts by weight  |
|-------------------|---------------------|
| Ammonium sulphate | 5 parts by weight   |
| Magnesium         | 1 part by weight    |
| Chaik             | 10 parts by weight  |
| Scapstone         | 2 Γ parts by weight |

Ordinary comm relal rine dust even though it is not perfectly pure may be used. This same formula not perfectly pure mar be used. This same formula may be used for nx rsi oft in metals. If aliver be substituted for the sine in this formula a very beavy deposit will be obstained which will have the white frosted appearance of aliver electroplating before the contribution. If aliver be substituted to the contribution of th

## MARING MILE ARTIFICIALLY

BY A JARRAN We have heard so much about the synthetic pro duction of perfumes ayrups dyes and what not from coal tar products that we are not easily surprised by the information that milk may be artificially made.

The m thod described below however is not a chemical one but consists merely in the mechani al admix ture of distilled water with crushed and finely ground Practically the only difference be sweet simonds tween cows milk and that made of almonds is cows milk contains animal casein while the artificial cows milk contains animal casedn while the artificial milk contains vegetable casedn. The latter will pro-duce a good supply of cream and if allowed to state amon time will become sour it may also be compa-lated by the addition of vinegar or acetic acid. When combined with grape usuar it is capable of generating some extraordinary organic substances. The artificial milk may be used with its and other in the same way that cows milk is used

way that cows milk is used

To make the milk produc half a pound of sweet
atmonds—the Valencia which is cheaper than the Jor
dan almond will give just as good results. The skin
of the almonds may be removed by scalding the nuis ann amond will give Just as good to results in a sain of the almonds may be removed by scalding the nuts in boiling water and perling them with a sharp knife The almonds should then be placed in a wooden thep ping bowl and thopped as finely as possible. Take bout two ounces of the chopy ed almonds and place them in a mortar with a small quantity of distilled

## Scientific American

may be squeezed through the cloth by wringing it gently as shown in one of the illustrations, but care should be taken to prevent any of the larger should particles from being forced through the meshes of

the closh
If some of the milk thus produced is set aside for
three or four hours a thick layer of cream will be
found on the surface. If too much water has been
used in forming the milk it may be necessary to add
a little sugar of milk to sweeten it. The artificial
milk has a slight almond flavor when taken clear
to this is practically lost when it is used with tea
coffee or coosa. The color of the cream produced is
cutto pair but it may be imported by using sense of
the almonds without the akins removed in the
prevent any litter almonds from finding their to you
revent any litter almonds from finding their way into
the mixture but one or two bitter almonds to the
approximation of the control of the control of the control
approximation of the control
approxi Half a pound of almonds will make three pints of

## SOME EXTRACRDIMARY DEWSTRIES

BY II Y GUST LYN ME HA J C STA BE A SYATH OF Pi k up any common heavy stone such as granite or compact limestone Lay it at the bottom of a vessel filled with a fluid transparent liquid Common tolls you that the stone will stay there



A COMMON REAVY STONE PLOATING IN A GLASSFUL

chemistry tells us that if the liquid has b

commutry terms us that if the liquid has been selected for such a purpose the stone will spring up to the surface as if it had been forced into mercery instead of being immerced in what seems to be water Liquids which are denser than glass march or common stones are not memory. Leaving the com-common stones are not memory and the com-common stones are not memory. Leaving the common stones are not memory and the common stones are not memory and the mine which is opaque caustic and emits suffooting apports the most information of specific liquid are the metals mercury and gallium and the metalloid bro mine which is opaque caustic and omits suffocating vapors the most interesting of such liquids are the aqueous solutions of the tungstoborates Their dena-tice reach 3.3 (saturated solution of cadmium tungstoborate) An idea of the meaning of such a number can be gathered from the fact that a man with his shoes weighted so as to lower his center of gravity could stand erect in such a solution with more than half of his body out of it. The chemist Klein who

1 1 1 temper perile of Mar space manning better states which we obscipant of space playing in properly in and expectablely stated that such space of the expectablely space, the state of the space than a silly space, the state of the space unexpected space and properties of the

that is alth soil, fee it to impletions thought with unexpected citylendens and problems or cisided such. As a role, however, the meals runs swiftly sad quickly over the water wills decomposing it. Soilium is the changest of the extremely light und-als, but it is not the lightest. Likhium, to beautiful metal of a silvery white color, is lighter than dry plue wood Ye, from the channel standpoint in more metallic in its properties than the heavy on mum white complex the other actives goalties in the list of soild alterests arranged according to their increasing demantities.

the list of solid abmests arranged according to their increasing densities.

Buch extreme differences in density are not touch among liquids yet organic chemistry gives us colorious transparent liquids which so differ that seed of the dansity of pentane is 68 that of bremform 39 3888, liquids are apparently more full than water sail it is always anusing to watch the continents of the unaware person who is requested to remove a gians full of bromodorn from one place to nunther Bremform is sometimes prescribed by physicians against the continents of the continents of

But it is with gases that the greatest divergences in density occur Indoform vapor which causes the intense stench of that well-known antiseptic is 197 intense stanch of that well known antisoptic is 197 times heavier than hydrogen When some isodeform is vaporised in a porçelain dish piaced over an alone hol or gas knoy it is partially decomposed look vapor is set free and remains mixed with isodeform vapor as lothic vapor is report and the properties of gases the experience tremains very beautiful if the airs quiet a lateral jerk pives to the disk causes the knyr of violet gas to esciliate heavily just as a liguid would do in infinite circumstances

# A SMALL BLECTRIC FURNACE,

BY A 2 PASS.

The accompanying cut shows the cross section of a small electric turnace made from a description of the Moissan furnace. In this one the brick and lime cav Moissan formace In this one the brick and lime catving are replaced in this one the brick and lime catving are replaced in the top face of the base is hearn a cavity about 1 x 1 x 1 linkes also two longitudinal grooves to receive the outbon electrodes

The cover is a similar stone with a cavity heven in its lower face. Both base and cover should be bound with a price of sheet from or in to keep the pieces in

with a piece of sheet from or tim to keep the piecess in place should the heat be great enough to crark the stones. The carbons are regulated by means of the vertical lever hinged at the base and attached to the carbon by means of a clamp. This clamp is at-tached to the lever at one place only. This allows



A SWALL BLECTURE PURWAGE

ntal movement summent normants movement. The electrodes are connected to a lanters circuit (alternating current 313 volts) by means of clamps. These clamps and other metal work are made from sheet aluminium—easy to cut and easy to shape. The botts used are short store

In such a contrivance calcium carbide calcium phos-phate phosphorus brass and alloys are easily pre-

pared Calcium carbide requires intense heat, the cavity should be small Gas carbon or powdered are light carbon is best to use Calcium phosphide is prepared by heating calcium cities carbon and red phosphorus. The phosphorus is piscod in first in small quantities this is covered by the other ingredients well inside and universised Some kinds of animal charcoal and calcium gattles will produce calcium phosphide
Phosphorus in prepared as directed in Newell by heating a phosphide

Photpaorus is prepares as cursoos in revenue we heating a phosphate, charcos and sained Phosphorus is separated and burns at the top It accessions used lines on the those of the stones and burns in the finance when the cover is litted. The gians like sing remains to the furnace. This is exceedingly bot. Places of proviolats are easily middle when yearled into the lysis—

the mass: Brane is easily made by heating along and commer. The stone may be obtained from the refere heap of a troop cetter. The section of an ide in all moves a noof instrument for couldn't be obtained in the couldness of the



Orindian the almonds in water. MARING MILK ARTIFICIALLY



Filtering the almone milk.

vater Then grind or levigate the chopped almonds adding water occasionally until about twelve ounces of water have been used. The longer the grinding is continued the this kr and ticher will the milk be continued the finit r and inter will the mink of Now take a plote of cheese (left about 13 inches wide by 34 inches long and riner it in clean water and after wringing R as dry as possible fold it double over the top of a pitcher and pour the companying the mortan through the cloth into the pitcher. The milk the sorting of cree and other minerals as in most rance useful or precious stones only will go to the bottom of their solutions. Their price bowever (the saturated solution of cadmium tengetoborate is sold at two cents a gramme) will for some time to come pre-cided sure has application.

Solid aluminium remains on the surface of such itsuids. To see a unstal facting over a watery fluid is however no new speciation for the chemist, several

The Soules, 2004.

STRE Soules, 2004.

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Vol. CH. - No. 18. ] NEW YORK, MAY 7, 1910 | 10 CENTS 4 COPY. SS 00 A YEAR.



The great impth, ill fest 6 inches, of the skip made it necessary to brild the ram how above one of the narry yeard streets and rathress (inches, upon a special street-and timber bridge as shown above. The issue, king

## SCIENTIFIC AMERICAN

### ESTABLISHED 1845

MUNN & CO. Inc. Editors and Proprietors

Published Weekly at No 361 Broadway, New York

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NEW YORK SATERDAY MAY 7th 1910

The Addition to almost equal to receive for examination filmerated ariticles on whereas of timer states of If the photographs are sharp, the articles plant and the facts of influential to be contributed one will receive executed attention. Accepted articles will be past for at regular space rates.

### THE AEROPLANE AND THE DIRIGIBLE

It is bistory of mechanical achievement it would be difficult to find a partial to the combination of totallike are and audatity with which a few man in as few years, have lifted the art on flying from the dreamland, of the impractical section of the impact of the imp

The significance of this really wonderful race become Paulina the Franchisma, and White, the Bag lishman is apparent only when we consider some of the defalls which have been cabled to this side of the Atlantic. That Paulinas should have won the \$50.000 prize in win superb style at the very first trails are tribute both to his own shill in manipulation and to reloute both to his own shill in manipulation and to race was son, but to appreciate the full significance of the race, we must remember that both enterenants and particularly White fies we for a considerable stretch of the journey at night time and what is of even more important that they did not hesitate to make both the ascent and the descent in the darkness. No orropkine is an instrument of purcision which can be relied upon to answer with certainty to the control ling hand of the operator.

There is something strongly suggestive of birth of flight in the develoption of the manner in which one of the contestants after leaving the ground swept through the air in a wide (rith is morfer to get the ins, of the land and the proper direction of flight or to lay key up again a course from which he had been driven by the wind. But certainly, the most difficult feat on a locality with which the key large and was that of making a landing at night time in locality with which the wistor was quite under quantited and where he had to make a wide develocking for a suitable stretch of unobstructed aurhave on which to allight

Last year in commenting upon the satum of the art of flying we pointed out that the one last obstacle to be overcome before flight could be reckened among the practical activity means was that of nancesatul starting and allghithm upon the average surface which would be encounted in cross-centurity flying and per forming these feats with certainty in a breeze of or disary strength. The London to-banchester mace would extainly seem to prove that this important stage in the development of human flight has been

range in development of minimal manifest in the matched and sure unfully juneed.

In strong contrast to these archivements of the scropiane is the series of disasters to atrahips, culmin ating in the wreaking of the huge dirigible "Suppella" in which have coursed during the last few weeks. Although the dirigible has proved to be perfectly stable and to possess the ability, to fight lin way against Aindes of considerable strength: the late disasters and notably the waveking of the "Suppella", suppleasation probabily the waveking of the "Suppella" in suppleasations.

## Scientific American

the fact that, wheever these bugs and delicate fabrica apprach, or are in contact with, the ground, they are in immirant danger of destruction. In this respect, they are in the same class as the owns steamship, whose capital cares little what whole may below since the factor of the land with everywhere deep water below his keep, but whose auxiliation in crease in proportion as the water shouls, and the versel again approaches the coast like

the great area which it exposes to the upwalled the great area which it exposes to the pressure of the wind. These elements, it is true, are not a source of so much danger when once the craft is well clear of the earth and has abundance of what the navier of the arth and has abundance of what the navier of the standard of the arth and has abundance of what the navier of the standard of the area of t

Wind pressure on large structures runs up to enough flaurs. The designers of bridges make provision for a maximum pressure of thirty pounds on every square foot of nurface. If we spilly this unit of pressure to the Zeppelin' we find that on a plantar represented by the total length of 48 feet and the diameter of about 40 feet, plus the area of the cars, unders ret, the pressure would amount to about 20 tons, and if we admit that the effective pressure due to the irrular shape of the gas hag and all the astronous control of the control of the cars, understand the state of the control of the state of the cars of

by whith the machine was held in position
If we include the Lake Container disasters, this is
the bird or fourth weeking of a Zeppella dirigible
by its being dashed to pieces in stormy weather after
making a landing and the moral is that these
ships of the air should remain and ras a possible per
mancath, affoat tying my when they whit to make a
suppract next on, and to which they must make fast
aspectate, and the suppract of the suppract of

# THE DECLINE OF THE UNIVERSITY IN SCIENTIFIC RESEARCH

O many valuable discoveries and researches are now due to esclarific institution under an extension of the desirable in the property of by private muniformer for specific pur poses that the question arises is it not to such agencies rather than to be universities and collected that we must look for the most active progress in future original wiertific favoretisation?

Not only are these institutions for special resourch freed from the duty and acres of teaching but what is of greater importance, their organizabut what is of greater importance, their organization and equipment are generally far more efficient. Every possible assistance is rendered to the individual investigator, and be in turn is carefully selected for his profit inerty and promise, and with ampire faculties at his disposal and supplied with an adequate treat in definite the selection of the selection of the creating definite income with entire freedom from flams creating definite income with entire freedom from flams.

At the heed of these institutions there are usually directors who are men not only of eminence in their special arience but competent to organize and court campitation of selectific research, which may latitude a number of workers often in wheley idflowed helds, yet all creaged in studies merging into one definite wheme. Each worker revelves full credit or his particular centribution, and the solution of the particular contribution, and the solution of the efficiency of organization, and cooperation characteristic of the best and most unders industrial and commercial practice. Yet there is no sacrifice of the true scientific spirit and the only elements of the commercial world that are applied are scenario of the true scientific spirit and the only elements of the commercial world that are applied are scenario of effort and resource, effectively of organization, and selectuar capital and plant to push to a satisfactory of the commercial world that are applied are seen only of effort and resource, effectively of organization, and selectuar capital and plant to push to a satisfactory of the commercial world that are applied are seen.

These conditions have attracted many investigators of reputation, and in such actentific establishments as the various laboratories of the Carnegle Institution of Washington the Rockefeller Institute for Wedjerl Research and the research laboratories of manufacturers' associations and large corporations,

bet to mention these conducts a suppless, much scientific werk is also. One might refer to the story of these conducts are the suppless, to national physical and bureaus of weights and were to mical observatories and biologue of the story of the suppless of the suppless

with the over increasing efficiency on the days, or special reasery institutions, we are breasth size to face with the fact that no longer are American capital part of the control of the

But important as are material support'and facili-ties to modern research, this is by no means the only or most serious question for the main of gastins triumphs eventually over the difficulties does their absence So extended have American universities recently become, both in scope and number of ata-dents that members of their faculties are sampelled ments that incomers of reer saturates are suggested on the merely to give an unduly large among of netrution along lines once considered understantal but in addition to offer courses in special or state branches involving no small amount of painsighing ureneration aration So, keen is the competition on the in ctual side and in the number of courses offence and in the desire for large registration that an and in the deare for large registration that an executive head of the university demands from his staff as a condition of salary advance or promotion, the greatest possible amount of teaching, be it congenial or not Under such conditions it is not difficult to see that the time and inclination for small investigation of the condition of the con special investigation and research by a young scien tist occupying a university chair may be se curtailed Furthermore, so intricate is modern uni-versity mechanism and even minor administration that from a professor there is required an ever-inthat from a professor there is required an ever-ir-stang amount of elerical labor in the compiling of statistical and other records, and information shout students and departmental activities, secord-ing to the exactions of the fluorational machinery, which to-day is and to initial commercial forms rather than commercial stiff-clear and economy of effort. Thus in the minumerate lang of the pro-fessor a function and misuse of his time, a partial explanation may be found for the hatterly poor showing that American professors of more sales. in comparison with their European collection. It condition, university presidents and traces America tell us, can be remedied by the next of great and further endowments for chairs and laboratories, but it now seems to question whether such funds are not more president. łn when applied to special institutions apart free cational machinery. It must not be underston e training of young men for scientifi has experienced any slackening of effort in our. has experienced any alackening or effort in our versities and technical schools for it is these wreat stimulated as never before by their professors, who will hear forward the torch of scientific progress. Education and original discovery seem destined in the future to be carried on by totally distinct sevanizations

That the sliver area in northerm Ontario is confined ally being widened is ordeneed by the discounding of native metal about fifty miles west of Cochange, as the Grand Trush Peatle. It is understood shift like discovery was made in blasting out a railway field discovery was made in blasting out a railway field when the news reached Cochanne, sixty propagators started out the next morning and this number is heing constantly sugmented by presh arrivals.

# Scientific American

## AEROŘAUTICS.

Mr. A. L. Pfitzner has been making successful flights with his novel monoplane (which was illustrated in cor insue of February 18th) of late in various place On April 15th he made three successful short flights at the Buffale Country Club, and in the fourth flight he the field at a high rate of speed, rising to ran across the nest at a man race or speed, rising to a height of ten or twelve feet, when a gust of wind struck the machine and drove it to the ground with great force. The aviator was bruised and badly shaken us, and his machine was more or less seriously damto his accident, Mr Pfitmer has den ated that his novel sliding wing tips work well

sen. A. M. Herring and W S Burgess have been Missean A. M. Herring and W S Burgess have been emperimenting with the former's new biplane on Pium Islams, opposite Newburyport, Mass. This new ma oblish, which was illustrated in our issue of March 1988, has demonstrated that it can side over the spread and rise from its single side with with the use of Wheels. On April 17th, Mr Herring made a short Fillips of about 165 yards On the link to made three collabs sights, in the longest of which he covered about seeley 8 Curtis, while flying the machine at an d beight of thirty feet, lost control of it descended and struck the ground head on, tely in a soft meadow. It was badly smashed, the aviator was not injured

Wille systation advances by leaps and bounds, aero-statish has had saveral serious setbacks of late To-begia with, on April 3rd the German belloon "Pom-merts," celebrated for having won the Bonnett cup mers, celebrated for naving won the bonnet cup race is America in 1908, fell into the Baltic Sea and three of its four occupants—one, Herr Delbrück, a member of the Reichstag—were drowned The next day. Frof Abegg, a well-known German chemist, was killed while making a landing, while on the 18th ulti mo the balloon "Delitzsch" carrying four men burst during a thunder storm while at a height of several d feet, all its occupants being killed by the fish. It was at first supposed that the balloon was struck by lightning, but this was afterward found not to be the case Emperor William, however, has had a thorough investigation made and is getting to gether all the facts regarding the igniting of the gas in balloons by atmospheric electricity

As far as dirigible balloons are concerned. Germany. time past has been in the lead with this form of air craft, has also suffered severely Afte ther making various cruises in the vicinity of Co pas, the "Zeppelin II" "Gross II," and "Parseval I airships flew from that city to Homburg on April 22nd arrange new from that city to Homburg on April 22nd and were reviewed by Emperor William As a gale agrang up, the airships were moored at Homburg over aight. As strong winds continued, the "Gross II" (which is a non-rigid dirigible) was defiated and shipped back by rail. The "Parseval" and "Zeppelin II" attempted to make the return journey, but only the former was successful in accomplishing it.
"Zeppelin" lost was and was forced to descend at d at Lin "Reppelin" lost gas and was forced to descend at him burg, where it was moored again over night, and fully inflated in the morning. At neon a sudden squall of wind tore the huge dirigible from its moor-ings and it floated off without a rew A half hour later it was driven to the ground at Wellburg. It side a cliff and broke in two The sudden demolishment of this, the principal airship of the Ger-man floet, has shown how precarious is the existence of these leviathans of the ai

On April 21st Prof John J Montgomery, of Santa Clara College, Santa Clara, Cal, lectured before the Aeronautical Society in New York upon his aeroplane experiments. These were begun in 1883, and Prof Montgomery met with no little success from the start After first trying a flapping-wing mechine, he next built a monoplane glider having wings 10 by 4½ feet in size, and patterned after the wings of a guil, i e, with a downward curve in front. Upon running down hill with this first glider, he rose and glide 600 yards. steered and maintained equilibrium by leaning his body to one side or the other He next endeavored sony to one side or the other He next endeavored see secure better control, and to this end studied the birds closely. He was able to determine just how thay warp their wings. Then be built servaral machines with warpable wings recembling a first wing instructure. He made scientific experiments upon the birds power of curved surfaces; and he finally enabled. I state that the state of the stat Sixture power of curved surfaces; and no numerical surfaces; and no numerical surfaces and a faced vertical tail (in conjunction with that worked splendidly, as movable horizontal tail (in conjunction with a movable horizontal tail) that worked spiendiffy, and that could be steered simply by warping the wings. This muchine, pitted by Daniel Maleney, what cut loose from a bulloon at heights of 1,000 to \$80,000 feet, and the aviator was able to pick a sinding place and nlight wherever he pleased. Prof Montured a U. S. patent (No. 881,178) on Sepgomery secured a U. S. patent (ro. 381,172) on tamber 18th, 1906, and in view of his practical de stration of sheering suithout the use of a vertical and the reader in not as one der, it would seem that this rudder is not as one as the the Wright brothers claim.

### ELECTRICITY

The Subway Telephone Construction Company of Chicago has promised to provide that city with a complete automatic telepi s automatic telephone system by the first next year At first it will cover only the district, but later will be extended to the of June next year residential sections

Marchants in the South have awakened to the value of rural telephone lines, and are seeking to develop them, with a view to increasing their trade among the rural population. In certain sections they made large contributions to aid the farmers in building their lines

The Westher Bureen has arranged to give daily weather forecasts by telephone to farmers in Texas At noon each day rural subscribers are called up, and the weather forecast is announced to all simul taneously Subscribers in towns and cities can ob-tain the weather forecast at any time of the day after 11 A. M by cailing up central

A writer in Physikalische Zeitschrift has been investigating the frequency of electrical oscillations when a condenser is discharged through a spark gap Ha finds that this depends to a large extent on the nature of the electrodes. For instance, a discharge between copper and sliver electrodes would give a longer wave length than a spark between magnesium electrodes, and he comes to the conclunesium is the most suitable metal for sion that mag spark electrodes

A new system of jointing lead cables has been sveloped in England It consists in placing a thin ribbon of pure tin between the surfaces that are to be joined, and then heating them with a blow lamp. The surfaces in the presence of the tin melt at a lower temperature than normal, and thus they are soldered together. The tin ribbon is treated with a composition to prevent exidation during heating a composition to prevent evaluation during nearing.

Another system of joining consists in the application of a mold over the cable. A piece of tin ribbon is applied to the surfaces which ree to be joined, and then molten lead is poured into the mold. The flow is so directed as not to burn through the lead sheathing of the cabl

The fourteen-year-old president of the Junior Wireless Club of America appeared before the Scuate Committee on Commerce last week to protest against the bill introduced by Senator Depew for regulating wireless telegraphy. The young president gave a very fortible argument in favor of amateur wireless telegraph operators, pointing out the fact that if the bill were passed it would check the inventive genius of some forty thousand experimenters lie also ion to the fact that it would be impe sible to enforce the bill without a veritable army of expert wireless telegraph engineers. The junior wire tees telegraphers claim that it is possible to cut out interference if the proper apparatus is used, and that the present attack on amateur wireless telegraphers is unwarranted

The Third Avenue Railroad Company of New York tried out hast winter a gasoline-electric car or its crosstown lines. Now another type of car is being tried, and a comparison will be made of the two The new car is a re-constructed horse car provided with Gould storage batteries and a pair of five he power motors The battery is placed under the reats power motors The battery is placed under the Fests of the car and has a rating of 420 ampere-hours at 84 volts. It is made up of twenty-nine plates per cell, and there are forty-four cells at each side of the car. The masses that are generated by the battery are carried off by a ventilating system and ex tory are united by a ventuality special and call the haust under the rear platform. The car weights only six tons fully leaded. It has been found to consume in actual service only 0.54 wait hour per ton mile, while maintaining a speed of six miles per hour with nine stops per mile

The steel hull of a vessel is rendere ection by the hammering of the metal, of vessel has to have its company corand every steel vessel has to have its company cor-rected to counteract its own magnetic lines of force The magnetic influence is further complicated by the The magnetic innuence is further complicated by the load carried by the reason! If this load is magnetic or capable of being magnetized. The ore-carrying ves-sels of the Great Lakes experience great difficulty on this account, and the United States Hydrographic Bureau is endeavoring to teach pilots and captains of vessels plying in this trade how to check their course by means of the pelorus. The pelorus is an ent similar to the sun dial, being provided with a gnomon and a graduated are on which a shadow of the gnomon is east. The instrument is set in a north and south direction, as indicated by the compass, and then by noting the shadow on the graduated are, it is possible to tell by comparison with tables, furnished by the government, just how far from the north and south position the guomon really lies, thus showing the compass error

SCIENCE.
Prof. Adams, of the Mount Wilson Observatory, has been making a spectroscopic study of Halley's comet He finds the head to be surrounded by cyanogen gas and the tall be to composed of hydrocarb

Sir Ernest Shackelton received a gold medal from the Geographical Society of Philadelphia at a dinner given in his honor on April 22nd Among those who spoke in praise of Sir Erneat's achievements were such famous Arctic explorers as Rear Admiral George Melville and Amos S Bonsal

In an article published in Light Mr Robert E Liv ingston states that the first man to use gas in New York city was Mr Samuel Legget who lighted his house at No 7 Cherry Street with it The people kept at a respectful distance from the house, fearing an explosion Newport Rhode Island, and Baltimore Md. followed New York

Ray. George M. Zwack, S. J., secretary of the Philippine Weather Bureau has prepared at the requisit of the insular government a paper on "The Return of Ralley a Comet and Popular Apprehensions" for distribution throughout the islands with the object of reassuring the natives, who, it is said, are already a prey to many wild rumors on this subject

The American Philosophical Society of Philadelphia has decided to assist in the movement for an expedi-tion for south pole exploration. The project was urged in 1909, when the following wientific societies united in an appeal to Congress The American Academy of Arts and Sciences American Geographical Society California Academy of Sciences, New York Academy of Sciences, Franklin Institute, Geographical Society of Philadelphia, American Museum of Natural Sciences, Geological Society of America Association of American Geographers and the American Alpine

In a le cture delivered before the Royal Society of Naples Prof A Piutil called attention to the discovery by Palmicri in 1881 of a characteristic line o helium in the flame spectrum obtained by heating in a flame 'an amorphous, buttery substance of a yellow color which was found as a sublimate on the edge of a fumarole near the mouth of Vesuvius. This is generally accepted as the first discovery of terrestrial hellum, although Nasini and Andelini in 1906, on ex amining the flame spectrum of a large number of vol canic incresistions failed to recognize the presence of helium in any of the specimens they examined unde the condition described by Palmieri

The Express of London claims that another word ust be added to the dictionary of gardening. This 'Caloriculture' the name of an entirely new system of horticulture which has recently been inaugur ated, and bids fair not only to replace the form of intensive culture of the French whool, but to revolu tionize the present system of fruit and vegetable force ing While it is nearly customary to look for extrems and favorable developments in the line of soil culti vation, through French means, to us in the United States, who have not the garden habit quite strongly as obtains in France it comes as a surpl that the inventor of the new method is a Briton Dr F Alexander Barton, bellow of the Royal Society

For the last year systematic excavations have been made at Ostia, the ancient harbor of Rome at the mouth of the Tiber The ruins of a large city built probably by Hadrian over the old republican town, have been uncovered. Archeologists consider the dig coveries as important as those of Pompell Heretofore It has been believed that Ostia was founded by Ancus fourth King of Rome stroyed by Marius during the civil wars rebuilt dur ing the republic sank into insignificance, and was buried in the sand and deposited in the Tiber when Trajan built the new port and city of Portus Instead of this it is now certain that Ostia not only continued to flourish under Hadrian but that the old level was raised six feet and that the republican town served as the foundation for a model city with rectangular wide streets, temples fora and squares

A case of extraordinary if not unprecedented hori zoulal temperature gradient is reported on apparently rustworthy authority ir the Meteorologisch Zeit-schrift for March 1910 With a temperature ranging between 0 deg and +2 deg C at Ill-isingtors Finland on November 18th, 1909 a temperature of 20 deg to 24 on november into a temperature of a day to a deg. C was simultaneously recorded at a point only 10 kilometers distant to the north, a difference of about 5 miles. Od deg. C (68 deg. F) in a distance of about 5 miles. While the climate at Helsiagtors is tempered by the Gulf of Finland so remarkable a difference between the temperature there and in the immediate hinterland is inexplicable capecially as the two stations at which observations were made are of the same altitude of the story, however remains to be told ef rang viz., that a little to the north of the place where the low temperature was reported the weather was almost as warm as in Helsingfors'

# THE NICE AVIATION MEE

# WITH DETAILS OF THE CROSS-COUNTRY RACE FOR THE LONDON DAILY MAIL'S \$50,000 PRIZE

One of the principal aviating meetings which has been held abroad this year was that at Nies from April 15th to 25th Two of our illustrations show Parman biplanes that participated in this meeting The one in light over the sea was piloted by Duray, an old time automobile rating driver, while the one an old lime automotic rating griver, which is shown on the leach was piloted by George (haviz Chavez on the 17th ultimo accomplished several long flights above the sea In one of these the fuel gave out and the machine landed on the beach, as shown The meet opened under auspicious weather conditions and some splendid flights

were made on the opening day At one time in the afternoon four bi planes and a Blériot monoplane were all in the air at the same time Effinoff Chavez and Van den Born, alt of whom flew Farman biplanes made some excellent flights. Rougler also The results of the first day's flights in the various

contests were as follows

Total Distance Princ my sugme in the Warman

Total Distance Princ—Emmo (Farman biplane),

10 718 kilometers (817 miles) Chaves (Farman

biplane), 105 508 kilometers (45 52 miles). Van den

Born (Farman biplane), 87 508 kilometers (45 44

miles) Metret (Volsim biplane), 15 kilometers (8,31

This competition was for the total distances flown in all flights made during the day by each competitor

Starting Prise, Without Passenger.—Efficient

to Manchester, England, on the 27th and 38th ultima for the prize of \$50,000 offered three years ago by the London Dally Mail. On April 33rd Mr. Chude Gra-London Dally Mail. On Appli Nava Mr. Chunes of hame White, an Raglishman, attempted the flight his Farman biplane. After covering the 115 miles Litchfield in 3 hours and 6 minutes, he quit battly with the violent wind and the cold. The next a his aeropiane was badly damaged by the wind win its temporary shelter. It was taken apart

in its temporary saster. It was taken apper a shipped back to London for repairs. Meanwhile a ator Louis Paulhan visited London and entered race. His Farman biplane arri-from France on April 37th, after working hard all day at don, he got it assembled and a aloft at 5 21 P M., flying in ately to Hampstead (5 miles London) and crossing the st

line at 5 31 He had a to made brilliant flights, on one occasion crossing the Var, and another time special train on the railway 1,000

flying half a nile out to sea Metrot flew for half an hour on his Voisin biplane, and Olicslagers made sev ral short flights in his Bleriot mon plane which appeared to interest the spectators more than the biplanes on account of its bird-like appearance The English entrants in this meet. Mesers Rawlinson and Rolls, were unfortunate The first named was unable to fiv more than half way around the track the first day on account of trouble with his Darross

around to track too first day on ac-count of trouble with bis Darracq motor which he was using on bis Hearty Farman biplane while Mr Rolls did not receive his Wright biplane from England

his Wright bijblane from England
The second day of the meet nearly all the aviators
made excellent flights. Herr Grades monoplane
stated to arrive and so be did not participage in the
slights. Kilmoff mede a fight of 80% milles, and Vias
on Born five Monitor Mr. Revillacon made a daring flight out to see While turning above the water,
he was apprached too toolsy by Edmorft, the result
being that although the two aerophanes did not tourch
accept other, Mr. Revillacon's foll line the sea, and was
except other, Mr. Revillacon's foll line the sea, and was

Chaven's wrecked Perman machine which dropped into the water when its fast greet out.
 Dump flying over
the breakers in his Farman biptone.
 A sovel hydro-strephne fitted with a floor-teriladir Amerial mater.

# THE AVIATION MEET AT MICH.

(Farman biplane), 80 meters (2824 feet), Storting Price, With Passenger—Egilmed, with Prince Koudacheff (175%, pounds), 100 meters (328 test)

Prize for fastest circuit of the course, \$400. Won by Egimoff, who fiew 8 kilometers (2.73 miles) in 6 minutes 23 3/5 seconds—a rate of 85 miles an hour In this aviation meet over a dosen avis peted, and many other flights were made.

peted, and many other flights were mase.

The greatest aporting event that aviation has had
thus far, as well as the chief demonstration of the
practicability of the seroplane for the rapid transportation of individuals, was the race from London

feet below

Boon after Paulhan started,
word was brought to White, who
had completed the repairs to his machine and who was resting at-botal Rushing in an automost to his aeroplane, he started at 6 from Wormwood Scrubbs in a suit of Paulhan But the latter l galhed an hour's firing time land darkness settled down, and alighted at Litchfield at 8-70 g

ameniment allegated at Litchieded at 4 to time; as the 14 gallons of genetics 26, carried were entirely consuming. White alighted at Roode, near Northampton, May a flight of 1 hour and 23 minutes in which he covered 60 miles. He started again at 2.54 A M; and encoceeded in gesting within about 15 miles of Litchiedel before Fathan again resumed this fourter, He deev over Weedon, Crick, and Ringby in the dark-room and alighted at Polesworth, nearly 10 miles from London, after an hour's flight. Late in the attenuous he sew 10 to 13 miles further, but the rand practically ended for him at Polesworth. The condition required the flight to be made within 6th height and with not more than two codes were and the longon and with not more than two codes were. Republications and the page 4875.

## Scientific American

INVESTAR INTELL ARCH OF THE BERLING SHOW ROTE BY A. S. INDUSTRE, OURAFOR OF AUTHOROPELOUT UNIVERSITY OF

There is a type of done that can be built without a sosficiding and that requires a man to be immured within the vault to issure proper construction. It is the invention and sole property of that most ingenious of savage races, the Bakimo and contains several prin choice new to civilised architecture

There are four tandamental types of arch and dome, of which one is the Baktimp ocularity. The simplest and least used, because least effective is of the simplest and least used, because least effective is of the simplest and least used, because least effective is of the simplest and least used, because least effective is of the simplest and least used, because least used in least used. In the least used in least used i

of backing or fill in proportion to the vault area fit is feasible for a gate in a long well an underground ball or drain but cannot stand alone and is a faire orth. A free portal, or a done rising into the air cannot be best on the principle which is concentrally the best on the principle which is concentrally the best of the principle which is concentrally the best of the principle which is concentral feat true being the use of wedge shaped blocks. When the last and central one of these piece—the key stone—is dropped into place the whole mass supports itself. The top cannot fall inward unless the supports are topped outward. The primary thrust is therefore all outward the primary thrust is therefore all outward. The primary thrust is therefore all outward the primary thrust is therefore all the sort is requisite. Another therent defect of this arch though we are so accustomed to it that we do not unusly more the fact is that until the key stone is fitted into final position a temporary structure must be received to hold up the parts already in place. The last type the backet must is a true done exerts not be the last threat is a true done exerts not exceed the last into the third or stone but soow.

The construction is used for the behiveshaped winter houses of these so-called sav ages and is spiral in plan as shown by the diagrams. A row of blocks is first laid on the ground in a circle—or more exactly a polygon. Each of these has a slightly slant top and each thus

raises its surface a little beyond the last until when the circle is completed the gap in height between the last and first blocks gives the thickness for the following courses in these the upper and lower surfaces of each block are parallel as in a brick but the gradual upward trend given by the first course is of necessity maintained

In each aurecessive round the snow bricks are learned inward more by having their lower surface affected for a level If set squarely end to end they would believe loss less inswards for fast they would tun ble For this reason the end of the block hast laid to cut at an angle. The next tollowing block has also cut at an explaint the end of the block hast laid to the state of the state of the state of the state of the laid of the state of the state of the state of the fast in believe the state of the fast in believe the state of the state of the state of the fast in believe the state of the state of the state of the fast in believe the state of the state of the state of the fast in the state of the state of the state of the state of the fast in the state of the st

rrom supping inward As the house grows the circles booone smaller until at last only an irregular polygonal opening is left. This is filled with a wedge-shaped block cut to shape It is however not a key stone as the remainder of the

structure supports itself
The blokes of firm anow are unit
ally dressed cutaids and handed
to placing to the man on the in
tide The last block he holds up
with one hand aliese to shape with
his ivery knits in the other, and
recogn into position life is then
enter the hones itself is antively
completed does be cut out the old
door, which to keep out the cold
sometime to hones itself is antively
enough to crawl through A long
wought to crawl through A long
to the Article's one been but in front
of the door, to break the force of
the Article's ory blasts lives a
window to present A manil apper
at the door, to break the force of
the Article's ory blasts lives a
window to present A manil apper
the Article's phasts lives a
window to present a firm of
the door, to break the force
of chimney Whateve heat in produced by the seal-oil larges is
mapes seefous necessity in the cili
major tikes recyllation or freedom

Whether the type is practicable in other materials has been doubted. The unsurpassed lightness of snow is certainly a great advantage. In heavier materials atrength would, however, compensate for increased stress of gravity, and good morter should make our



Plan view of partly built but, showing how each blee!



Eskimo but partly built. The snow blocks are laid in a continuous spiral course



Hection through Estime snow house THE PROULIAR SPIRAL ARCH OF THE ESSING SHOW HOUSE for the inward slipping tendency that weightier ma

totals would show

The greatest difficulty in working in ston would be encountered in shaping the separate pieces of me soury. Owing to the spiral and leaning, construction no two blocks can be exactly alike in other shape or ster and in every succeeding course such block series and in every succeeding course in the block of parts more and more from the right rangle in its proportions. To compute in advance exactly the program of the proportions. To compute in advance exactly the program of the proportions to compute a magnetic or each piece so as to finance true. John state would be a matter of much complex match matter.

calculation

It might however be practicable one the cal in
tions had been determined for a building of standard
size to draw up a table of the angies and dimensions
required for each successive block. If the size of th
structure were reduced or increased from the stand
structure were reduced or increased from the stand

ard each stone would only require to be diminished or enlarged by a fixed ratio It would take our ablest engineers longer to plan such a down than an bekimo would need to build a

It would take our ablest engineers longer to plan such a dome than an bestime would need to build a village but the resulting simplicity of construction due to the inevitableness and simplicity of the progress of erection without any temporary supports but treases or reinforcement might more than compen

The spirally ascending bevel locking Fakimo done is the only true vault any part or the whole of which will stand entirely by itself

### A GASOLINE MOTOR DRIVEN EARTH-BORING MACHINE BY WAITER LAN FORD

The details of construction and method of operation of a unique gasoline motor-driven earth boring machine are shown in the accompanying illustration like drive was recently designed in (alifornia by charles I believ and the photograph represents it in working position in actual operation at Sacram nice and rear believed.

It is stated that with one of these man three about 55 miles of holes were borred for use in free ing along the right of way of the Western Patifis. Rallional between Marywills and Orn-ville (al. These holes were borred under particularly trying conditions as the ground was gumbo land with the everytion of a shirt strict of marsh soil and so hard and so dry that every bit of it had to be broken with it is and crowbar when due by hand Pat of it in addition to the hard ground had about 20 to Y per cent small cobible yet this labor saving dwil e bord through all of it and did the work of term twiste to fifteen

Such a machine is of great value for bor log holes for jests for numerous other uses for which shallow holes are required and for the turnous of lightening the labors of man Exportance shows that the harder the ground and the mort difficult it is to work the more amounty a machine of this class is desired.

This intirily new unique and practical on gine driven appearance is a most remarkable device in this simplicity and cowing to its wide range of use as a labor sact. It stands un surpassed it will be seen that it is or mely simple, castly operated and cuttirely jractical

of miles ample castly operated and cutterly practical and will be found a great (commits rof time and money where post holes are to be dug electric line t I stain hor t liphone poles and or where tree and whose are to be planted in holes uniform in size at top and bettom and of suitable diameter and depth I has bed to be resetted for me.

It is hid to be ractical for use extrywher as by at the matchine will woke statical trily in either dry ct we're will or in any place wher the methic and edition as it have readily through hardpan and shale soft wandstom and small obbbe and as it will bore at different angles and on either rids or back of the truck it will do equally good work whither on kwel ground movem ger and or hilling.

ar Reedley (at a great number of holes wer bord in very hard hardpan for large poles the ma hin being particularly successful in this work because the continut between its effi-

cause the contrast between its efficiency and hand labor was as a sirongly marked. At Mendota Cal a record was made by one of these machines on large fire, work in hard dry earth 90 holes being bord 97 ft apart and 30 in these deep in 60 consecutive minut a the holes 1 ing 8 in h a in during the for use in boring anall holes a

For use in boring small holes a ritial engine of th double cylin d r type is utility d that develops 72½ hows pow r. In boring holes for large poles a machine of this type is fitted with an 18 lich augr effecting a depth of 89 feet. The power is supplied in this case by a duble cylinder gas line engine of 12 horse-power cai a ity

This divice is said to be ince passive to equal as a man and a boy only are required for its effic, in working the boy to drive the team and the man to manage the man chine Its not earning capacity is said to be greater than that of a threshing machine costing divines as much Its stanon of use the said of the said of

It is maintained that in cold countries where other farm work



PORRIDO POSTESSE OF MARTE-BURING MACHINE READY TO BORR A MOLE.

is impractical during the severe season, post holes can be dug and fonces built during the winter, as this machine is well adapted to boring through ice, frozen around, hardpan, shale and the like

In the planting of orange trees peach trees, grape vines or in having a piece of land underlaid with bard pan in which holes for any purpose are expensive to dig this form of machine will do the work of making mening through any crust for the top root of

The upper frame and horing tower being on a rotatable platform, one can custly adjust the machine to a hole on either side or at the rear of the machine When the device is in a position to hore a hole, all that it is necessary to do is to pull the feed clutch, and the auger drops to the ground and begins work, when the auger is leaded, by releasing the feet clutch and pulling the hoist clutch in, the auger is holsted clear of the ground, or to any other position that may be

It is of interest to note that besides boring in the kinds of soil before mentioned the machine will in dry clay, or in awamp land without any change of augers or bits no ground being too sticky for it to There is no necessity of stonning the machine to ckan mud off the auger as the machine does that freelf

If there is an occasion to hore a line of holes down the middle of a well traveled road it will do the work without difficulty. A small type of earth boring ma 4 feet and which is equipped with two augers 8 and 12 inches in diameter, while a larger machine has been developed which will hole to a depth of 6 feet latter is fitted with three augers 8, 12, and 16 inches in diameter

inches in diameter.
It is stated that no change of shaft or augur is required to make the depth inditated. The time required to move from one hole to another and begin work in a fence line is from 15 to 25 seconds.

The fred pinion of the machine as well as the feed rack, drill shaft gearing, and auger shaft are made of crucible and machinery steel so as to withstand a sudden impact as when stopped by running against rocks, old posts and similar obstacles

Chain belting is used of the standard sprocket type Chair belting is used of the standard approved type and in case of a break can be casily replaced. It will be seen that this machine in boring does not seeape the earth but cuts it with chisel bits, which are quickly detachable the entire set being changed in two minutes if desired

It is reported that this machine has bored many holes 30 inches deep in hard ground in fifteen seconds for each hole from the time the auger touche the ground, and it is hard ground indeed when the cannot be bored in a minute. It has force and therefore all the attendant has to do is to pull the lever and the machine does the work

# LAURCH OF THE "FLORIDA."

On the morning of Thursday, May 12th, there will be launched at the Brooklyn Navy Yard the second of the two largest battleships yet built in the United States the 'Florida" The sister ship, the "Utah," States the 'Florida" The sister ship, the "Utah," which in December last took the water at Cainden N I from the building slips of the New York uilding Company, weighed about eight thousand The launching weight of the 'Florida' will be lone about nine thousand tons, which is, in itself a record for an event of this character. The keel of the "Florida' was laid on March 9th of last year, and the work ida was laid on March 9th of last year, and the work of construction has been carried on uninterruptedly under the supervision of Naval Constructor William J Haxter with Naval Constructor William G Grossbeck immediately in charge in view of the great imp

nportance of the ship, and the gratifying rapidity with which she has been built. preparations have been made to render the coremon; of launching particularly brilliant. Among the guest of launching particularly brilliant. Among the guests on the launching palatorns will be President Tati, Severary George Von J. Meyer, Assistant Secretary of Florida with his staff, Admirat D. weep, and Reserved Admirats Evans. Septry S. througher, W. alluvright, Potter and Luntze. As the battleship fieed is now present at the yard between six and soven thousand blus-lackets and the officers of the ships will assist in giving dignity to the event. In agreement with the custom of laving our ships christened by a representative of the State or city after which they are named the of the State or city after which they are named, the ceremony will be performed by Miss Elizabeth Flem-ing of Jacksonville Fla

The naval constructors and employes of the Brook lyn Navy Yard are to be congratulate ed on having, for in easy tars are to be congrantated on awing, for the second time demonstrated that they are capable of building the largest and most modern warships, not only with dispatch but of the most thorough and durable workmanship, for it will be called to mind durable workmanship. for it will be cause to mind that from these very ways there was launched on September 29th 1904 the flagship "Connecticut," which, although a much amelier ship than the "Florida" (leasn by about 6,000 tons, in fact) was nevertheless the

largest vessel of her time in the United States navy. and approximately as large as any vessel in the navies of the world. It is a long step, however, from navies of the worst. It is a long step, however, from a fs,000-lou "Gonnettent" to a 18 f3-fb-on "Fairdia," and the Brooklyn Navy Yard should receive full credit for the fact, that while eighteen and a harmonth elapsed from the laying of the keel to the launching of the "Gonnecticut," it has taken only jaunching of the "Connecteut." It has taken only fourteen months to do the ame amount of work on the big ship. The material has been built into the hull at an average rate of about twenty-few tons per working day of eight hours. If all goes well, the hull and accessories will be completed early next spring. The date of the completion of the machinery is some what uncertain, the recent reorganization of the navy yard having thrown the steam engineering shops

somewhat out of their stride

The greater length of the "Florida," which exceeds
the "Connecticut" by over sixty five feet, her greates the "Connecticut" by over sixty few feet, her greater beam of eleven feet four and a half inches, and her in reased launching weight of many thousand tons necessitated, or ourse, a great enlargement and strongthening of the permanent and launching ways, and severely tract the capacity of the building slip Our front page illustration shows how the ram of the ship outside articity arross on on the attract of the ship catende articity arross on of the street of the the wall of a building In spite of this fact, the stern of the vessel reaches

most to the buikhead wall on the water front Just here it is well to notice how, in order to see the desired speed of 20 75 knots, the lines of the ship have been fined out, as compared with former battleships The entrance of the "Florida" appears to be as fine as that of our armored cruisers. At the same time in order to secure good lifting power forward, when the ship is driving into head seas, above th water line the sections are flared out very rapidly, thus giving the ship a form which is not only buoyant and seaworthy, but adds greatly to the appearance of

The "ways" consist of the permanent ways made up of the supporting piling, cross caps and longitudinal timbers and the launching ways, in which she im mediately rests, built to conform to the underwater the ship, which travel with her as she moves down into the water The heavy longitudinal timbers, which form the sliding surfaces between the fixed and launching ways, are thoroughly lubricated with a special preparation, consisting chiefly of tailow, lard oil and graphite The contact surfaces are made lard oil and graphite The contact surfaces are made sufficiently broad to bring down the maximum pres-sure on the ways to 23 tons on each square foot. The ship is released and started on her swift slide into the water by sawing through the "solo beams," which are the last members that connect the launching ways with the permanent ways. The "Florida" will move very slowly at first but gather way rapidly, and her

very slowly at first out gather way rapidly, and her highest velocity will be about twenty miles an hour With the launching of the "Florida," the United States navy will have affect its first complete division of ahips of the dreadought type consisting of the "Delaware," "North Dakota," "Utah," and "Florida." A study of the accompanying table shows that the COMPARISON OF THE ' NORTH DAROTA 1978, AND THE "PLOBIDA," 1990.

" North Dakota " 51N feet 9 inches, N5 feet 354 inches, S5 feet 11 inches S1JED tone, S1JED tone, S1JED tone, S1JED tone, S1 inches, S inches, Ten Pourteen Gif feet 6 inches, Hi feet 9% inches 18 feet 9 inches, 18 feet 5 inches, 18 feet 5 inches, 20 feet, 19 inches to 6 inches, 6% inches, 9% inches, 17 inches, Beam Displacement Coal supply Oil
Belt armor
Purse tarmor
Battery armor
Smokestack prose
Pwelve Inch guns
Five Inch guns,
Spect contract

"Florida" is an enlarged "North Dakota, having the ween perpendiculars, and two or three feet greater length over all, three inches more beam; one foot seven inches more draft, and 1,835 tons greate displacement. She is designed to have three thousan aspisermont one is designed to have three tanusammore horse-power, but a quarter of a knot less speed. The armament in each case consists of ten 48-sailte 13-inch guns mounted in five turrets on the central line of the ship. The 12-inch pieces for the later ship. in the case of the "Wyoming" class will be more powerful, being fifty calibers in length with a correspond fritt, deing hit; cansers in length with a correspond-ingly greater mustle velocity and energy in the broadside, torpedo-repelling battery, the "Florida" has two more 5-inch guns than the "North Dakota."

It is claimed by our Navy Department that the Florida" and her sister are the best-protected warships afoat special attention having been given in her design to guarding the vital parts of the ship against design to guarding the vital parts or use many mortal injury and to the localising of the destructive effects of projectiles and torpedoss. Against sinking by torpedo attack the "Florida" is nateguarded by an other bases of the hull and an unusually powerful pumping plant for ridding the ship of such water as may enter Against gun fire she presents

robably a more complete system of artifer protection han any contemporaneous warship. The main armor elf, over eight feet wide, has an average thickness of lawn tenders. probably a more complete sys belt, over eight fred wide, has an average innomes or eleven inches, above this is another eight-foot belt averaging nine inches thick, while the five-inch broad-side battery on the main det is and the bases of the smokestack carry heavier armor than has been placed on any previous United States ship, the front start of armor being \$4\times inches has been placed of armor being \$4\times inches inches inches inches and a wall of \$4\times armor To reach the bases of the smokestacks a shell would have to pass through \$4\times armore the same through \$4\times armore through \$4\times armore

smokesticks a shell would have to pass through Nig-thebes—an unprecedented but, as the Japanese war showed, a necessary protection Between each pair of chick puss is a Sinch transverse, splinter bulkbad. The "Florida" will be driven by an equipment of Parsons turbless, swirking on four safets. They are required by contract to develop 28,000 horse-power, which, it is estimated, will enable the ship to maintain an average speed of 20 76 knots on trial. As a matter of fact, she is likely to do from three-quarters to a knot better than this. The "Florida" will store, to addition to 2 500 tons of coal, some 400 tons of oil fugi. addition to 2 500 tons of coal, some quy tons or on tage. Our naval constructors have long recognized the wallow of oil as an auxiliary fuel, and as far back as 1849, when the plans of the "North Dakota" and "Delagare" were drawn, provision was made ton storage of all, the ships of that class carrying 400 tons.

built by contract with a private yard, was laid on March 15th, and the keel of the "Florida" on March 7th The "Utah" was launched on December 23rd, 1909, at the 50 per cent stage at pletion, and the "Florida" on May 13th will take th water with 68 per cent of the work completed, a comparison which establishes once more the much tested claim of the Brooklyn Navy Yard that it can build as rapidly as the private yards

# The Aubricating Value of Mineral Lubricants at Wish

The behavior of a mineral lubricant at very high The behavior of a mineral lubricant at very happy interpretative is dependent upon its chemical and physical properties upon the nature of the atmosphere with which it is in contact—dry af carbon dioxide, or water raport—and upon the pressure of this atmosphere. Schreiber in a recent article describes his investigations of the lubricating value of mineral lubricants of very high melting points, in various conditions The diminution of the lubricating power at high temperatures is due to the evaporation of a portion of the lubricant and to the formation, oxidation, of compounds of the nature of asphalt, i a, compounds insoluble in benzine it is not due to polymerization, as is generally believed This increase in asphaltic matters is not produced in the presence of water vapor alone, even at a pressure as high as 71% atmospheres. In this case the diminution of the lubricating power is due solely to the evaporation of part of the lubricant. On the other hand, when the icant is in contact with a gas which can exert an oxidizing action, compressed air, for example, the for-mation of these insoluble compounds is the chief cause of deterioration Schroiber deduces from these experiments laboratory methods of measuring the lub ing power at high temperatures, according to the class of machine in which the lubricant is to be used

## The (urrent Supples

The current Supplement, No 1792, contains an un-The current Surransers, No. 1792, contains an un-neal number of interesting literated articles Mr Harold Holeroft contributes a splendid paper full of practical suggestions and holpful ideas on the prisci-ples of vitroous enamelling of east iron for industrial purposes Mr Henry A Wise Wood's excellent review of modern stereotypy methods in continued Rear Animal'R H & Beacon critically considers the armorclad, and points out what type of vessel is likely to be evolved from it in the future. The North African region lying in Algeria and Tunis affords almost an unlimited field for achaeological research. Some recent overies in this country are trated article by the Paris Correspondent of the SCENFIFIX ARRICAN It is very difficult to recognize stars by studying the star maps and then seeking the stars marked on the maps Mr F R Russell, in an article entitled "Where to Find the Stars," provides the necessary link between the star maps and the sky A table of seroplanes at Olympia is published, with some observations on the theories of flight. The food supply of the future is considered by H B Armsby

La Lumière Electrique publishes a series of articles eviewing the effects of the great Paris flood in Janureviewing the effects of the great ratios, telegraph, tele-ary, 1910, upon the electric stations, telegraph, tele-phone, and electric light service of Paris and its sud-tered. urbs. The St Denis establishment escaped inunda-tion owing to its judicious arrangement of pumps and sluices and its elevation above the ground, as sitions and its elevation above the grouns, and con-tituded in operation without any interruption. Meat of the other plants were less fortunate. Even the new underground wireless telegraph station at the Champ de likes was submerged for several days, and its delicate apparents was very seriously injured.

## Correspondence.

## WHY WATCH SPRINGS BREAK.

# To the Editor of the Scientific August

It was with an amateur's interest that I read the isonssion in your pages as to "Why watch springs break." As th on apparently still rem settled, I feel tempted to contribute some addition views on the subje

rly clock springs were finish giving the convolutions considerable friction upon each other For this reason, when running down, there was a very audible shuffing sound within the there was a very saudible shuming sound within the clock every few minutes, indicating the propelling force was spasmodic. Not only so, but the ticking sound of the escapement decreased in loudness as the time was prolonged from the last loosening of the To regulate this it occurred to me to apply a more unctuous lubricant to the spring to prevent the said friction. The result of so doing was a gratifying uniformity of tick—but only for a few hours—until

unnormity of team-out only for a few nours—until the spring broke After the third experience of this kind I caused to regard it as a more coincidence, and thereafter applied no oil if there was sufficient to prevent ruiting already on the steel.

The uncoiling of a watch spring and of the kind of clock spring that has just been described differs in that the watch spring unwinds from the outside of the coil, while the clock spring arbor backs up and un-winds from the center of the coil For this reason the latter is not subjected to a breaking from contraction due to cold, as there is always some room for the contraction to take place—excepting a possible mo-seentary period just after winding. The same is not the case with a watch spring.

over-lubrication is destructive to the structure of stoel in a clock spring, by rendering all the convolu-tions continually active and under unremitting strain, the same would also apply to a watch spring Watch the same would also apply to a water appring water apprings being smaller than those intended for clocks are naturally proportionally stronger and may endure the strain longer, but that it is detrimental is proba-ble. But oil on a watch spring is absolutely necessary solely to provide for this thermostatic movement which can only take place back and forth, to and from a fixed point—the arbor Yet the wearying strain on a spring due to over-lubrication can only be a contribu tory cause to the prevalent breaking of this part. Ex nce goes to show that the most frequent breakage is from an hour to three hours after wind-ing, and that the most frequent position of fracture is just outside of the annealed tip attached to the

Thus the owner takes his watch from his pocket where its temperature was, say 80 deg, and winds it until it brings up hard. The coll is then central and solid upon its arbor, which is held fast by a pawl

In a little while the wearer of the yest containing in a little while the wearer of the vest containing the watch romoves it, hanging it on the back of a chair while he retires for the night The temperature of the watch gradually falls to say 60 deg. Has con-traction been provided for? The morning will dis-close. If the coil has not been wound too tightly on, if some time has elapsed before cooling to enable it draw on what has been paid out, or even if the rate of cooling and consequent contraction has not exceeded the rate of release due to the movement of the works, the apring may escape But what surprised writer is not the breakages but the length of serv

ice many aprings attain

When one considers that the greatest movement of contraction is on the outside of the coil, because of its contraction is on the outside of the coil, because of its greater area, that the coil has just been readered taut and rigid by winding, and that then a powerful con-tracting force is added thereto, principally on the out-side of the circle where the leverage is greatest, it is not difficult to realize what an unundurable sitzal takes place close to the fulcrum, the arbor, for the spring is then but a solid lever

The fracture of a spring in many places is also not hard to understand, if we imagine a spring stretched to its elastic limit by contraction from cold with no alack to draw upon, each turn of the spring, from the outside inward, at an ever-increasing tendon. An inner turn anaps, instantly contracts, and by that proinner turn snaps, instantly contracts, and by that pre-cess increases the spreading or expanding tread of its temper. The change is altogether too rapid to permit of any uncolling movement, and the force thus added to the adaptest surrounding strand fractures that, agitating force with such succeeding fracture until, like a "Prizee Raport's drop," the pentup strain comes to rest with a replact's drop," the pentup strain comes to rest with a replact's sufference.

That the pieces display magnetism does no scenarily indicate that it was produced from external

nce, but rather that it was evolved by excessive strain and retained by the steel by virtue of its hard nees, as is similarly evidenced by many machinists

tools subjected to severe service.

Regarding the preference of springs to break in the

mer months, is it not sufficiently evident from the wing three causes?

The more constant and wearying strain due to

the better lubricating effect of warm oil.

2. The increased solidity of the coll when wound

up, due to a thinner film of oil between the convolu ions, also due to warmth

3 The looser texture and greater proportional

3 The looser texture and greater proportional hrinkage of a warm spring compared with a cool one. As to the remody for this uncertainty of time-keep-rs, it would seem sufficient to provide for the longitudinal expansion and contraction of the springs, and the simplest way would be to make them of metal in-sensitive to these changes. Such an alloy has been I IN SCIENTIFIC AMERICAN SUPPLEMENT, described in Schwitzic Americas Supramers, in 174, by M (ulliame, which be calls 'Invar' and in composed of steel with an admixture of 36 per cent and in composed of steel with an admixture of 36 per cent graduated schole for instruments. The fact that it does not rust should complete its adequability to this purpose, as then it could be used without imbricant and thus, except for a short portion at one time, be relieved of continuous and crive strain.

Just how the nickel component will affect its per manency of temper remains to be proven, but even if it retains sufficient recoiling force for its purpose fo five years only, it would at least give warning of its

nee years only, it would at meat give warning or its waning strength and not leave its owner in the lurch, which is perhaps all the improvement needed Another possible remedy which modern practice would indicate as quite feasible would be to carbonize would indicate as quite reasing would be to carbonuse the reds or plates, from which the springs are drawn, from one side only. The result would be, when chilled, a hard side (for the inner side) and a soft or elastically tough side (for the outer side) with a general benefit of greater spring power with improved tensile

Watchmakers will tell you that the breaking of main springs saves meny good watches from having their plyots out off, from shear wear, and the yiews of the manufacturer need not be consulted but the ordinary citizen would prefer to have the spring as reliable as the rest of the watch

JAMES E FRANKE St. John N B

## INTERESTING MAGIC SQUARE.

To the Editor of the Scipatific Ambrican In the December 31th issue of the Scipatific Ambre-can (page 436) Mr. A. Galpin gives an interesting construction of magic squares, containing all the odd

| 42 | 84 | 36 | IR, | r) | 74  | 66  | 38 | 50  |
|----|----|----|-----|----|-----|-----|----|-----|
| 10 | 44 | 35 | 10  | 11 | 3   | 776 | 09 | 80  |
|    | 84 | 81 |     | 21 | 18  | 3   | 78 | 70  |
| 73 | 'n | 47 |     | 31 | 25  | 18  | 1  | 10  |
| 10 | 65 | 87 | 40  | 41 | 25  | 16  | 17 | 9   |
| 1  | 78 | 67 | 200 | 81 | 43  | *   | 1  | 10  |
| 12 | 3  | 77 | 80  | 61 | 56  | 45/ |    | 140 |
| 20 | 14 |    | 'n  | ħ  | 43/ | 16  | 8  | 30  |
|    | *  | 10 | 8   | 81 | 64  | 86  | 88 | 40  |

numbers in the inscribed diagonal square. But this construction is applicable not only, as Mr Galpin says, when the basis is a prime number, but more generally when the basis is an odd number (1, 3, 5, 7, 9, 11, ) The proof is very easy there is here the square of 9, as example of the simplest odd number ot prime the general proof is an interesting exercis of algebra. os. Italy

### STOROGEN IN A HOT-WATER STREET.

To the Editor of the SCHENTIFIC AMERICAN
A short time ago I noticed a phenomenon which I believe will be of interest to many of the readers of

Deliver will be or interest to many of the research of the Stiffright America.

The main building of our experiment station here is heated with hot water it has been one of my duties to see that the system is working properly, and in this connection I have had to open the air vents on the radiators frequently. I was surprised to find that the radiators on the top floor (a two-story building) al-ways seemed to have air in them, in spite of the fact that the system was fully charged and very little or no new water admitted. I began to suspect that this condition had to be accounted for in some other way condition had to be accounted for in some other way was there not a possibility that this gas could be hydrogen. For what other gas would be likely to form under those conditions, unless it be a trace of carbon monoxide? At any rate, when I applied a matrix that the familiar pop of brdropen and buryand with its characteristic almost colories fame and buryand with its characteristic almost colories fame of testing 11), the question suggests itself: Is this a se of exidation of the iron setting free hydrogen? Is it an electrolytic effect, caused by galvanic couples of

either carbon and iron or iron and the brass con stage cargon and iron or iron and the grass consis-tions in the system. Or is the gas methane? It may be noted further that the gas does not seem to collect in the radiators in the lower floor to a great extent. If any Of course, this may be due to the gas a dissolved under the increased static pressu static pressure on the radiators of the top fic or is no over ten feet of water at the present time. The water is of exceptional purity, being supplied by a spring The fact, however that small quantities of water have to be added occasionally to replace the leaks in the That only be settled by chemical analysis C WESTERGAARD Puyallup, Wash

## AN EARLY APPEARANCE OF ENGINE COMME

To the Editor of the Sciparitic American

The change which has come to the people in reference to comets is worthy of notice. Beventy years the change whith has (once to the people in reter-ince to connect is worthy of notice. Seventy years ago when Encle's comer made its appearance a great deal of fear was aroused. I was a young boy, but remember very well the alarm of the prople. It was indeed very strange and portentous, for it switched about from the senith to the hortzon, and was very Its color varied from a light to a flery re and its length was such that it stretched from the and its length was such that it stretched from the soulht to the horizon I hovered so long and was so conspicuous that all classes, young and old, were greatly impressed About that time the Millerite ex citement prevailed, and there were many who looked upon the comet as a sure sign that the world was surely coming to an end. There have been other comets which impressed the people but this exceeded ers in the impression made

### Salem. Mass STEPHEN D PART

## A New Sense Organ of Butterfles.

Every butterfly collector has had the unpleasant ex-pertence that some butterflies, and particularly those of the species of Catocala (mourning cloak) will no-lice his approach from a distance and fly away in time. This observation led Tetens to think that these animals must have an auditory organ which warns them of approaching danger by receiving sounds, and accordingly he expressed the supposition that two pit-like depressions at the first posterior segment of the ody might be organs of hearing A thorough investigation of this organ, however, has been made but recently by Prof Dr Decgener, the results being pub-lished in Zoologische Jahrbücher, Abteilung für Austomic, vol 27, No 4 1909

is rather surprising that with a group so frequently collected (although indeed investigated, as a rule only as to their position within a system) as the Nortuide, an organ could escane observation which is found quite generally in this group and which is by no means introscopic, but can be observed without difficulty with the naked eye as a striking formation on each side of the first abdominal segment. This location probably explains why this organ should have been seen by many persons without arousing the suspicion that it could be a sense organ, for naturally enough such organs are looked for chiefly at the head, particularly at the feelers, although other parts of se body may be the seat of specific scase organs, for instance, grasshoppers have their organs of hear-ing at the base of the abdomen, that is at the same place where the corresponding organ of the Nortuida en discovered

When examining the animal we see on each side at the line separating the chest from the abdomen and near the points where the rear wings are attached, a deep channel which toward the surface is fached, a deep channel which toward the surface is surrounded by several humps. The external morph clogy of this organ varies in details with the different species of Noctuide, with some the opening is scarce by visible from the outside being concealed by long ly visible from the outside being concessed by tong hairs act close together. The microscopic examina-tion of a series of sections shows that only one of the ridges in the vicinity of the cavity of the organ, the one nearest the back, can be considered a "sensitory ridge," but that this one has true sensitory cells and sensitory hairs and thus gives the organ the character of a sense organ. Telens's supposition, mentioned above, that this is an auditory organ may very well be maintained since the structure of the organ an awers all the requirements of an organ of hearing Still experimental confirmation of this hypothesis will have to be awaited Dr Deegener promises a further report, dealing with this phase of the subject.—Pro-

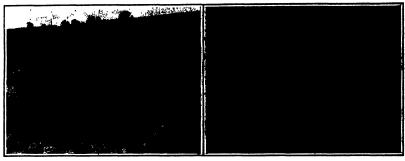
Approximately 3.748 miles of new main track were built in the United States during the year 1909 as compared with 3,214 miles for 1908. The 1908 record was the smallest since 1897, when 2,109 miles were built. These figures do not include new second third butlt or fourth track sidings or electric lines. The net in crease during the year is about 1615 per cent, and 28 per cent less mileage was built than in 1907

# REINFORCED CONCRETE WATER WORKS CONSTRUCTION

BY FRANK C. PERKINS

The accompanying views of the Indianapolis water works show an Interesting application of relations concrete to this class of construction. A gravity flow supplies the rainforced concrete filter plant from the Indiana State. Curtal Cuall which was constructed originally by the State for transportation purposes, but was taken over for water works service A 1 a disA reinforced concrete pipe line which is 860 feet in length, and has a diameter of 86 inches, and a shift of inches inche, conducts the raw water to the precipitation basin. The pipe is laid 11 feet below the hydratility gradient. It is reinforced with ½-inche wisted bars spaced 8 inches on centers, the shell of the pipe being built in three operations.

are 8 inches in width and 19 inches deep. They are carried on 18-inch 1-beams, incased in occerete and bolled to the odjuman. The reinforced partition walls, 1 foot thick, are 350 feet in length. They are reinforced in both directions, and measure 14 to 11 feet in height. The entire slab covers 70,000 square feet in each double filter It is built moscilithe, without



View showing construction of the ground-arch floor, with the reinforcement and forms in place

Operating floor of the chemical house in which the water is purified in lime and iron saturating tanks.

tance of about 6 miles above the intake to the filters are to sted the head gates and concrete sittles ways of this canal which is carried over Falls Creek near the filter plant in an open aqueduct at an elevation of about 18 feet above the creek.

The chemical house columns, floors and walls as well

The chemical house columns, floors and walls as well as a start way and roof are of reinforced concrete throughout. The lower part of the building contains the line saturating tanks over which are constructed the tron solution tanks all of which are of concrete They are used in connection with the congulating basins in the treatment of the raw water during seasons of excessive turbidity.

The following account of these works is based upon data formhold by the constructing engineer, William Curlis Mables. The start, which is drawn from the Raw Riter is interfied by coagulation in precluitation basins, which are provided with battle walls spaced for the tapart, and which are reinforced for the prevention of cracks. A 4 linch state of concrete, reinforced with stailed roots squared 4 feet spart in each direction is used for lining the simples unbankments of earth in the six highly state of the spart of the spart of the state of the spart of the spart of the spart of the links in this change, that in his case 8 feet square, in

The water is measured in a Venturi meter, 42 inches in diameter which has a throat diameter of 21 inches The meter is built in the raw water conduit the indicating apparatus being located in the laboratory In the construction of the conduit a concrete cradle of inches whe was first laid to grade in this were imbedded the lower rode, which were heated and bent in the field to the required shape, and left long concept to project a foot into the upper ring. On the cradle were then placed the semi-trends metal forms, which were fastened down by staked timbers. The nititure and I of recurst, was poured into the space forming the lower half of the pipe. The upper half was then constructed by inverting the metal forms. The cost of the pipe, which contained about 500 cmble yards of concrete, was 124 day per cubble yards of concrete, was 124 day per cubble yards.

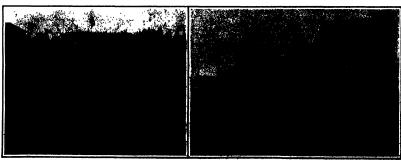
The pure water reservoir, with a capacity of the million gailons, was built near Palla Creek, on a gravel foundation, at ordinary ground water level. The earth fulling is 2 feet deep on the cover, the weight of the structure listed overbalancing any upward preserve that may occur. The groined arch bottom was desired to reals the upward throat of high ground interest of the properties of the bottom consists of \$\frac{1}{2}\$ (not twisted bars, spaced to lacks on centure in such direction.)

The filter cover consists of reinforced 3 inch slabs, supported by concrete beams, a trifle less than 20 feet long, and spaced nearly 7 feet on centers. The beams any atampt to provide expansion joints. A cable trave wy with a page of 469 feet was used in the commention. A stationary engine and cable was used for propelling a shuttle car on a narrow-gage track, over which the concrete was handled from the mizer to the archeway, 10 cultic yards per 440 pating used in coversulting the control of the control of the walls \$12.00 feet.

The reinforced concrete aqueduct, 300 feet in length, contains 4,600 evile yaris of concrete, which cost \$4.55 per cuble yard including the cement, steel, sand and gravel, as well as the lumber, forms, labor, and concrete labor It is 41 feet wide and has four spans of 50 feet each with a 10-foot rise from the springing line to the softi, and a crown thekness of 18 inches for each of the four segmential arches.

to the softi, and a crown thickness of 18 inches for cach of the fore segmental article. The foundations for the piers, wing walls and abuments were carried down 18 feet below low water, and rest upon a bed of and and graviel. The squedect takes the piace of a wood aquowiet, which was supported by steel trussee on massory piers, all of which were carried swar by a flood which undermined the middle pier, the superstructure breaking up as the subtracture crumbled away.

With regard to the use of concrete for works of this character, Mr Mabee, the constructing engineer of these water works, makes the following comments:



Meet reinforcement of the Silinch conduit.

The content execute plant for paining the concests.



## Scientific American

Observée has many advantages over other types of southwisten. It is eastly and conveniently hands and transported, other at a less cost than stones ma-searly, and often suitable sand and gravel for the work in hand can be found on the site. With proper supervision, skilled labor is not essential in the usual work, moreover, the art of mixing and hand-ling concrete has been so perfected that machines do most of the work. Concrete has the additional advantage over stone that it may be molded into intri-

To produce concrete t

To produce concrete surfaces of a satisfactory smoothness and uniformity, it is necessary that the molds be carefully and properly built, and also that the conports be of the proper consistency to flow adily into the prepared It is also neces molds. It is also necessary to theroughly churn and keep it in motion in the molds until the sir has been removed and every erevice filled with mortar Properly handled in this mortane it will not be necessary. manner, it will not be nec essary to brush or plaster the work after the removal of the forms. Con-crete may be placed in moderately freezing weather, provided proper precau-tions are taken to warm tions are taken to warm the gravel or stone and mad, to heat the water and to cover the work until initial set takes place.

The problem of prevent-ing ugly cracks forming in concrete is one that has concrete is one that has worried many engineers.

Plain concrete is liable to crack where you least ex-

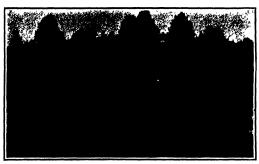
eracks where you least ex-pect it, and it has become the practice to provide for those cracks by building short sections in alternate blocks. However, by the judicious introduction of steel bars, objectionable contraction cracks can be entirely eliminated.

entirely eliminated.

The water works ongineer or superintendent is par-ticularly interceted in the subject of waterproofing concrete it has been shown that wet concrete is more dense and consequently more impervious than more dense and consequently more impervious than dry concrets and that concrets becomes more or less persus as the quantity of cement is increased or di minished A smoothly troweled surface produces a water-tight film or skin it has also been found that siaked lime added to the concrete mixture helps to make it less permeable. The lime does not injure the cement in any way, although retarding the setting Coal tar, pitch and asphalt mixtures applied on concrete are used with more or less success. A wash composed of one pound of Ive, five pounds of alum and two galions of water, applied with a brush and well rubbed in, has been used successfully on govern ment fortiScati

ment fortifications.

A rich cemeit mortar plastered over concrete makes
a very good waterproduig medium Proper attention
to these details will produce a water-tight structure,
if there is not likely to be contraction cracks, but in
works of any magnitude these are bound to occur
and they can be best provided against by the litzduction of steal bars. A rich concrete property rein



Covered reservoir under construction, a wing the ground floor, the reinferced slab reef, and the

forced, conted with plaster and troweled smooth makes an ideal waterprooff structure

The Baylight Efficiency of Artificial Illum In a recent publication of the Bureau of Standards. in a recent publication of the Bureau of Standards, Mr H E. Ives suggests that there is need of some method of estimating the resemblance of artificial illuminants to daylight, that is, of determining their daylight efficiency Assuming that, by the extraction of certain qualities of light in an illuminant its color or certain qualities of ugar in an imminant incomplete or could be brought to resemble that of daylight very closely, the daylight efficiency of a source might be expressed in the form (intensity of surface) for two suggests two methods of studying this question. The first is based upon the use of suitable absorbing screens which, as explained above, could be used to bring the color of an illuminant into near agreement with day-light, though reducing its intensity in doing so. Mr Ives presents some spectrophotometric curves of various sources of light, and a diagram illustrating the amount and nature of light from the various sor amount and nature of light from the various sources which must be absorbed to produce white light. He also tabulates the "daylight efficiency of a number of artificial illuminants. The method, however, is of of artificial illuminants. The method, however, is of practical rather than of scientific interest since it depends upon the particular wave-length for which the intensity is assumed to be unity, when plotting the spectrum curves. In addition, "selective" sources such as the mercury are lamp

which yields a spectrum consisting of isolated bright lines, would work out to zero efficiency at cording to the above by sensation such sources contain a certain amount of white light Mr Ives then proceeds to discuss the fact that any color can of white light and one ray of the spectrum. The used in attaining such a match to the in usity of the source studied is then regarded as an alternative method of defining white light efficiency which Mr Ives in this case terms "white sensation effici ency" He points out that classification on this meth od gives rise to materially different results from those arrived at by the

ficiency in the case of the second method appears to be higher Yet the result gives no indication of the ability of the source to reveal colors of surrounding objects, and merely indicates the color of a white sur face illuminated by the source in conclusion, Mr Ives remarks that the first method is preferable from the practical standpoint, and the latter from the purely scientific one

It is estimated that the Gold Coast and Ashanti could supply 60 843 logs of mahogany ar year if the internal communication were better With mechanical haulage, such as traction engines and light tramways, the output could be increased to some 0 logs per annum without depleting the natural



Agricules by which the water is conducted to the fitter plant of the Indi

bilities of reinbrood concrete are shown in this graceful, arched aquada DED CONCERTS WAYER WORKS CONSTRUCTION.

# THE HEAVENS IN MAY

BY HENRY NORRIS RUSSELL

is seldom that so much of interest to single month as in the one which is

just before us Pirst and foremost, of course, is the return of lialley's comet to the posi-tion where it is seen to the best advan-tage. Early in the month it is favor ably placed for observation before day break, on the 18th it passes directly

between us and the sun, and later it appears to eve greater advantage in the evening sky

At the beginning of May the comet is about 74 million miles away, but it approaches us rapidly, its dis-tance diminishing to 41 million miles on the 10th, and 27 million on the 14th As it was about at the limit of visibility to the naked eye on April 12th, while still 135 million miles from us, it is now a fairly conspicu

The planet Venus is fortunately near by and serves

an excellent "pointer" to the comet. Anyone, however little familiar with the heavens, can easily find the latter by observing the following di

rections. e a window from which the eastern sky is visible clear down to the horizon Rise about 3:15 A M and look due east. The very bright starlike object, low down in the sky, is Venus. The comet is to the left of this and a little higher up at a distance about as great as the length of the bowl of the Great Dipper It will probably be rather fainter than the four stars, forming a great square, which above and to the left of Venus, about twice as far away as the comet.
These directions hold

good from May 1st to May 12th On the 14th the 12th On the 14th two comet will be on a level with Venus, and a little farther to the left On the 16th it will be much lower than the planet and about 20 deg to the left. After this the comet, or at least its head, can hardly be seen clear of the morn-

ing twilight
It will be very interest ing to watch the comet grow larger and brighter night by night as it comes nearer to us How long its tail will be it is impossible to predict. The best time to see this however. will in any case be from the 7th onward, when the

moon is out of the way moon is out of the way
and the sky dark. The cumet will be larger and
brighter, too, at this time than previously.

Even after the head gets too near the sun to be

seen, the tail may be observable in the mornings of seen, the tall may be observable in the mornings of the 17th and 18th extending upward and to the right from the castern horizon, perhaps broad and fan-shaped, from the effects of perapective since the end of it will be much nearer us than the head

or it will be much nearer us than the head On the evening of the 18th or morning of the 19th (according to the observer's longitude) the comet passes between us and the sun, and the earth will be enveloped in its tail if the latter is long enough (over 15 million miles)

this evening is clear it will be of great interest If this evening is clear it will be of great interest and importance to look for illumination of the sky in the early evening, just after sunset, the cometic attain will be in the east, but a few hours later it will have passed over toward the west. If, as is seen-itness supposed the tail is a hollow come of light, there will be two times at which the sky in general is comparatively brightly illuminated separated by an interval while we are in the darfare center of the all Measurbile, observers on the opposite side of our planet will have the rare privilege of seeing the sun through the comet's head. Only the extreme western portion of the United States is included in

this favored region, but as the comet enters upon the sun's disk at 6 22 P M by Pacific standard time and remains on it till 7.22, the transit will be visible all along the coast. The comet passes almost squarely across the center of the sun from west to east.

Paradoxical as it may seem, it is probable that the ordinary observer, even with a small telescope and orquinary observor, even win a small celescupe asset dark glauses, will not be able to detect even the slightest trace of the comet's passage With powerful instruments the nucleus, if solid, might be seen as a dark speck against the sun, if it is over 50 mlies in diameter, but it is improbable that it is anything like so large, for, as has already been stated in these columns, the whole amount of light reflected from the county of the property when you are the columns and the columns are the columns and the columns are the columns and the columns are the colum

columns, the whole amount or ingar resected from the a single mass 30 miles across would send us. It is possible, too, that the absorption of the gases composing the cavelopes of the head and the tall may be detected by means of the spectrocope, and as we will be looking through the tail lengthwise,

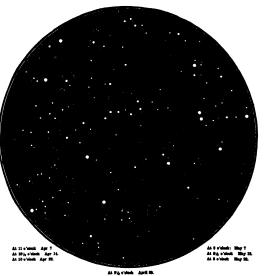
the sun on the Sth and of the moon on the SSTd. The former is an important solipse, the maximum duration of the total phase being over four minutes, but unfortunately the track of the shadow lies almost out uncortanates the track of the anadow use almost entirely in the Southern Comm. only crossing the southern half of Tammania, so that few stations are available for observers. As a partial cellpse it is visi-ble throughout Australia, New Guines, and the neighboring islands

boring islands.
The lunar eclipse of the 13rd is of more interest to us, being visible throughout the United States, excepting Alaska. The moon enters the earth's panumbra at 9-32 eastern standard time, and first touches the shadow at 10 48. At nine minutes after midnight the shadow at 10 44. At nine minutes after middings and despress of the disappears in it completely, and does not entered till 1 A. M. At the middle of the colleps, however, the coulters deg is only about 300 mine inside the shadow, so that it will be considerably illuminated by sunlight refracted through our staneophers. At 2 35 A.M. the moon takes leave of the shadow antirety, and at 2 84 of the pecunical collection of the control of t

This eclipse will be of importance to observers on the Pacific coast, as it will give them a chance to photograph Halley's comet on a dark sky The comet will have set for unin the east before totality

THE HEAVENS With so much else to an gage our attention, our be short. The most prominent constellations in the est are Gemini and Canis Minor, in the northwest, Auriga, due north, Cassiopela below the Pole, Ursa Minor and Draco above, and the Great Bear almost overhead. In the north-east Lyra is prominent, and in the east Hercules, na, and Bolites. Scorpio is rising in the south outh is Virgo As our initial shows, there is not the slightest resem blance in the stars to the figure for which they were

We may note the bright star Spica, a spectro pic binary at a great distance from us, and the double star  $\gamma$  (now close to Jupiter) which is now separable with a small telescope, but in 1835 could hardly be seen double with the largest instruments then existing. The two components were then at the closest point of the very eccentric orbit, in which they revolve about one another in some 180



RIGHT SKY: APRIL AND MAY

nearly 15 million miles of it will be there to exert any possible effect on the sun's light. Even so, it will not be surprising to many astronomers if nothing unnaun) is detected.

usual is detected.

Such negative results will however be actentifically valuable, since they will enable us to say that the materials composing the comet do not exceed certain limits of mass or density

Transits of comets across the sun are very rare.

The most remarkable previous instance is that of the survey comet or the survey comet of 1812, which, longing no bright that it

could be seen close to the sun in broad daylight with the naked eye, vanished completely when in frost of the sun's disk, showing that it was practically per-

On the evening of the 19th we may perhaps alre-On the ovening of the 19th we may persaps airway see the cornet's tail in the evening sky, though its head will set while the twitight is still very strong. On the 20th, however, it will be visible till about 9 P M, on the 23th and alterward until after 11 P M.

afterward until after 11 P M. On the 21st the comet's head will be close to the star  $\gamma$  Geminorum; on the 23rd about 10 deg above Procyon, and on the 25th near  $\epsilon$  and  $\zeta$  Hydrae Fuller details will be given later

This month is also notable for two total eclipses of

years. THE PLANETS

ry is evening star until the 25th, when he passes through inferior conjunction, between us and the sun, and becomes a moraing star. He can be best seen at the beginning of the meath, when he sets more than 1% hours later than the sun. At this time be is in Taurus between Aldebaran and the Pielades, and

in Taurus between Alciberan and the Pielades, and should be easy to see.

Yenus is merting star, rising a little after 3 A Yenus is merting star, rising a little after 3 A and encoedingly conspiences all through the north Mars is overaling star in Gental, setting above: 10-20 cutte close to the star of Genthoretis (above; on nor-juspiter is well just opposition, bit is visible most of the night, remaining in sight till mearly 4 A M, on the 1st, and till a little better 3 A M, on the Sist. Saturn is moraling star in Aries, rishing abject an boor earlier thus the sun in the middle of the seacht and the sister of the star of the sister is the star of the sister.

spicocour. Uranus is in Sagittarina, and opnes to the meridian at 4 A.M on the 19th. Neptune is in Gemini, do nervable most of the night. On the 26th is in conjunction with Mars, being 1 deg. 58 min. south of the latter. This may be a good chance for amateurs with (Concluded on page 565.)

# NATURE AS AN INVENTOR

## BY PERCY COLLINS

Civilised man justly prides himself upon his numer-cus invantions and mechanical devices, but it is possi-ble that inventors in general would beast less of their achievements did they realise that the patents in which they have established their rights are easily nothing more than modern reproductions of earlies which have been employed by Nature from the beginning of time It is a fact that there is exactly an invention of man that has not its prototype in Nature Semetimes these prototypes are of a rengh-and ready character. More often, however, they have been brought to the highest pitch of perfection. It is little short of amasting that primitive man should have remained blind, through so many centuries, to the significance and value of these inventions of Nature. It is have been said that aimost all of man's achievements as an inventor have their prototypes either in the ani and or vegetable kingdom. Othously, therefore, it would be impossible to attempt—in the limits of a soft article—anything approaching a complete exist which they have established their rights are really le—anything approaching a complete cata Yet a few of them may be lorge of these coincidences

selected, almost at random, and they will serve to show how, after much labor and thought, man has perfected devices which at the time appeared to him to be original, although in reality they were nothing

As a first instance we may take grasping toolswhole tribe of implements ranging from surgical forceps and sugar tongs to gasfitters' pliers and the vast pincers by means of which great masses of white-hot metal are manipulated upon the glant anvils of our workshops. It is a arcely too much to suffrm that, without such tools as those, art, science and manufacture would long ago have reased to advance. The reader needs only to pause for a moment to realize how important a part is played by these familiar imple-ments in the activities of human life, and when man kind first discovered how to make and use such things he must have benefited instantly Yet all these tools have their parallels in Nature, and one is fain to imagine that some of these prototypes might still supply useful hints to modern toolmakers

most perfect example of the powerful pincer in Nature is the claw of a crab or a lobster. The power of the crab's claw is so great that a bite from a large crab will inflict a severe injury. It is related that fisher men who have been feeling for crabs in the recesses men who navo been receiving for trans in the recisions of the rocks at low water have or assimilarly had their hand seized by a large specimen, and being unable to liberate themselves have been drowned by the returning tide. Among other pinter-carrying animals are scorpions, while the inserts known as carwings carry a dainty pair of forceps at the end of the body, and emules the totals for feldibut belts runni, and dell. and employ the tools for folding their smple and dell and employ the tools for folding their simple and deil cate wings. The oppossible thumb and for finger con-stitute, in effect a most useful pair of pilers adaptable to many uses and it is strange that man should so long have overlooked the lesson in mechanics which Shears and scissors are of course closely allied in principle to grasping tools yet they have come to us only with the advance of civilization—no savage tribes having the least idea of them or their (Continued on page 384)









The first bottle-a goard

The first ball-and-socket joint - a hursan

Nature a electric battery—the

The first spinners a most whose caterpillar

The first pump-a heart



One of the first boxes, a receptacle which holds Brazil nuts, so clevely nacked that, if once taken out, no human hand can put them back again



Too first hypothermic syrings. The arrangement of isnes and cause in which the female acception me. a and collarges a puncture. The next meents are mixed form a time through which recome is injected.



The first balloon the "swellfish which has d to infe to itself with air and skip over the water, map lied by the breeze



The lanters fly of tropical America. Light without heat—the



The first seamstrees. The tailor bird, which stitches the leaves of her



The first " capping apparatus -an octopu



The agg of the marre. A hox that ensue roll off a shelf, If globarood it rolls broad and around.



WATURE AS AN INVENTOR



The first hinge To 1 sorry system of the 1 sould so his so him, a to assume a shape so that found in any hardware shop

## OF SCIENCE AND INVENT CURIOSITIES

SUCTION BRACKET FOR MIRRORS,
There is nothing very hovel in supporting a device
on a smooth surface by means of a suction cup However, the suction support illustrated in the accompanying engraving is provided with a very ingenious



SHAVING MIRBOR ATTACHED TO A WINDOW PARE

method of producing an efficient vacuum. The photo method of producing an emittent vacuum. The pro-graph shows a shaving mirror secured by means of a bail joint to the suction bracket and the bracket is supported on a window pane. So tightly does the desupported on a window pane. So tightly does the de-vice adhere to the window that it is possible to raise the window by lifting the bracket. The bracket can-bet be pulled off the glass without danger of breaking The line drawing shows a se



THE MIRBOR BRACKET BROKEN turns AWAY TO SHOW THE SUC-

projecting from the square shaft. The sleeve is provided with a pair of ball knobs by which it may be gripped and turned, forcing the shaft outward and thus cupping the thus cupping the

view of the bracket, and illustrates the method of produc-ing the suction. The

provided with a rub-ber disk, the center of which is secured

which the mirror is supported Mounted on this shaft and free to turn thereon is a sleeve in which a spiral groove is

cated by dotted lines. There is no possibility of leak age except under the edge of the disk. A bracket thus applied will adhere firmly for weeks at a time. The id may be secured to any smooth surface and is particularly adapted for a shaving mirror because it may be placed directly on the window pane where the best light for shaving can be obtained

TRE OLD "INVICTA" LOOMOTIVE AS A MONUMENT A public monument of interest to all who make a study of the evolution of the modern locomotive has recently been act up in Canterbury, England Fixed recently need act up in tanterpury, England Fraction on a production beneath the Norman walls of the bistoric (ily is the old "Invicta engine, which in May, 1830 hauled the first train on the Canterbury to Whitstable Railway—the ploucer fron road of the



GEORGE STEPHENSON'S "INVICTA" HOW SET UP AS A MONUMENT

south of Britain. The locomotive was built by George Stephenson. It will be observed that the cylinders and valve chests are very similar to those on the notive. The cylinders are 10 inches in dern loc diameter with an 18-inch stroke The wheels feet in diameter The boiler is 10 feet long by 3 feet 4 inches in diameter, and the working pressure was 40 pounds per square inch.

The locomotive is now the property of the Corporation of Canterbury It is coated with

## THE TELESCOPE THAT PIRST PICTURE UP The large reflecting telescope illustrated

herewith is interesting by reason of the fact that it was the first instrument to pick up Halley s comet on its present visit to our circle of the solar system. To be sure, the comet was discovered on photographic plates made with other telescopes before the photographic record made with the reflector here shown But it was Prof Max Wolf who first identified the contest on a photograph taken with this reflector at the Heidelrvatory The discovery was made on 1st, 220 days before perihelion. The rg Observatory Heldelberg reflector has a focal length of 918 feet, and the diameter of the mirror is 28 inches. The



THE TELESCOPE WITH WHICH HALLEY'S COMET WAS

mounting is thoroughly up-to-date, and is electrically controlled. The observation platform is adjustable vertically by means of an electric motor

## A NEW COMPETITOR OF THE HORSE.

The "zebrasa" has made its bow to the public This creature is a new thing in the world, it never having creature is a new thing in the world, it never having existed until a year ago It is the hybrid offspring of the African zobra and the Texas donkey There are at the government experiment station at Hethesda, Md, six young zibrasees. Their sire is the royal Abyssinian zebra which King Menelik z



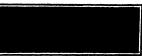
A VALUARLE HYBRID—A CROSS BETWEEN A RESEA AND A DONNEY.

President Roosevelt The latter turned the striped reminent moneyes: The latter turned the striped creature over to the experiment station, and here the idea of developing a new race of animals was con-ceived. These six young ones are the nucleus. They are regarded as offering great promise. Certain of one regarded as outering great promise. Certain of them combine the docility, strength and utility of the mother with the spirit, activity and boasty of the father. The yearlings are already larger than their mother. They are beautifully built and should be adapted to the many uses to which the domestic ani

## TROCHA CUTTER

A soldier in the Spanish and Philippine wars, who

had abundant experience in squeavering to an increase the wire entanglement of the Spanish trodus, has recoming devised a very simple cutter which may be aging plied to the bayonet of the gun. A soldler in action will desnounther himself of everything except his gent



WIRE-CUTTING ATTACKMENT FOR CURL

and bayonet, and hence the pilers which are usually furnished for cutting barb wire obstructions are from quently thrown away, so that the only method of get-ting through an entanglement when encountered in ting through an entanglement when encountered is to hammer the wire with the bayonet and a stone. Not only is this process slow, but it is fatal in a galling life for this reason the inventor has devised a cut-tor which may be secured to the bayonet without interfering with the use of the gun and which will op-erate to sever the wire by a single thrust of the weapon. crate to sever use wire by a single tartest or use weapon.

As shown in the illustration, the outler consists of
two jaws pivoted eccentrically so that when extending forward in their normal position they are open,
but when pushed back they close in sportsion, the
gun is inverted, the point of the bayonet is rested as gun is inverted, the point of the bayonet is resided on the wire, and then the gun is thrust forward with bayonet sliding on the wire so as to guide the latter between the jaws of the cutter. As the jaws are thrust back they close upon the wire and sever it.

DÖNTGENOGRAM OF A FULLY DRESSED MAN. The range of visible rays from deep red to violet forms a very small part of the solar spectrum Beyond the red, the rays are too long to affect the retina, but we can detect them as heat. At the other end, we have the ultra-violet rays which are too short to affect the the ultra-violet rays which are too short to effect the retina, but manifest themselves on the photographic plate Richigen rays are not fround in scullight, but if they were, and if our year were so constructed that they could detect only these rays, visible matter about an would take on a very different aspect from that to which we are accustomed. The accommanying illu-ration shows how a man would appear. The man ap-tention shows how a man would appear. pears semi transparent and one can easily make out his two watches and chain, his tie clip and the buckles of his suspenders. The metal parts of the buttons on on his suspenders. The metal parts of the buttons on his coat are also quite evident, and his ribs may be plainly seen. A pickpocket might envy such power of discornment, but he would have difficulty in conceal-ing his plunder if others were possessed of similar

The photograph was taken instantaneously with a Snooks apparatus, and is reproduced from "Archives of the Röntgen Ray" Heretofore, it has required a long exposure to take a photograph with the Röntgen rays, but recently a system has been devised by which long exposure to take a photograph with the Rintgen rays, but recently a system has been devised by which a very sudden and powerful discharge is produced capable of making an instantaneous photograph. This sudden discharge is made by using a tuse in place student uncharge in made by using a tube in place of the interrupter of an induction coil. The tube is melted when the proper intensity of current is reached, producing a very sudden break of the primary and a powerful discharge of the secondary Exposures of 1/50 to 1/120 of a second have thus been obtained.



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### Of General Interest.

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deleted point and further to provide an arrangement with will cashif the plates to is
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BRI MI — J. I. Fanklick. New York. N. N. The brush is made in sections capable of blog readily laken apart for (canning sterill hing or ranching may one of the sections in case the same is worm out or laquired thus asking the cost of a new brush. Means provide for the fresule king relieved of some strain when the brush is used and this insures a strong and durable brush is used.

## Hardware and Tools.

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DEMOUNTABLE SIM.—B. J Brusser, New York, N Y The insprovement perplains to wheels for automobiles and other wisiteles, and lie aim is to furnish a demountable rim, ar-ranged to permit quick and, convenient re-moval and with it the inflatable tire, and replacing of the rim by another whenever it is

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906,004 986,586 906,078 906,361 906,839 906,470 906,488

## THE MEATERS IN MAY

# (Concluded from page 378.) copes of sufficient size to pick up beint greenish disk of the planet.

the faint greenish disk of the planet.

The moon is in her last quarter at 8 A.M on the 2nd, and is new at midnight on the 3th (during the solar collipse visible in Australia). She reaches her right on the sut (units). She reaches her first quarter at 9 P M on the 15th, is full during her cellpae on the night of the 23rd, and comes to the last quarter again at 5 P M on the 31st. She is nearest us on the 8th, and farthest away

During her circuit of the sky al During her circuit of the sky she passes close to Venus on the 5th (and likewise near the comet the same afternoon), to Saturn on the 7th, Morcury on the 10th Mars on the 13th (pretty close), Neptune on the 13th, Jupiter on the 19th, and Uranus on the 28th Princeton University Observatory.

## MATURE AS AN INVESTOR.

(Continued from page 379)
use Those admirable workers in skin,
the Kaffirs and Eskimos, employ only
knives. The idea of the knife edge in mbination with the leverage afforded by tools of the grasping type had nover occurred to them Yet shears are exemplified by the jaws of many insects, as well as by those of tortoises and turtles only of comparatively recent years has man made boxes in which to store money, trinkets, or other valuables Yet Nature has had her boxes from time im memorial Some of the most interest of these take the form of seed-pods as, for example the stout casket in which Brazil nuts are packed. In this instance, too, the primitive idea of the puzzle—later elaborated by the Chinese as well as by other races of mankind-seems to lie dormant, for here we have a vast number of nuts, so eleverly packed pod or casket, that if or they are taken out it is almo at imi

The hings as attached to a lid or door has been known to man only for centur-ies, yet Nature has made use of it liter ally for billions of years. In proof of this statement, it is only necessary to inte a bivalve shell, such as an oyster or a clam. We know from goologic that such shells are among the earlie indications of life upon this earth with which they are acquainted The eggs of which they are acquainted the eggs of many insects, too, open with a vory per-fect little hinge, while the little lid which covers the cunningly contrived mest of the trap-door spider, is also hinged in a most ingenious manner by ne of silken bands

Savage man had no means of preser ing light for himself after the settling of the sun, and it was only with the slow progress of civilization that he became inspired with the idea of artificial illuministion. Yet this was not for want of examples set by Nature, for many and mais carry about with them bright lights during the hours of darkness. Marine during the hours of darkness. Marine organisms. In particular, emit phosphorescent radiance, while many kinds of insects, to which such names as glow worms, firefiles or lantern-dies have been applied, are highly luminous. In many instances the precise manner in which applied, are nigaly luminous. In many instances the precise manner in which the light of these creatures is produced has beffed scientific inquiry. Still, the fact remains that Nature had her living glow lamps ages before man emulated

Formerly the surgical operation knows as cupping was so constantly performed that searchy any man statused middle age without undergoing it. The object in view west the reutorul of the object from some defaults good; the surgion, by means of the appearant, acting a stone parter by the surgion, by means of the appearant of the surgion, by means of the appearant of the surgion, by means of the appearant of the surgion of the surgion before presents to the sufficient the operation of the surgion of very well nave invested this operation.

Trees and Shrube to Avoid in after canning the numerous suchers which stud the long arms, or tendric, Canning and Preserving Fruit of an octopus. The principle involved is like to the Housewife the long with the program. There is the princip with the princip that the princip that the princip with the princip.



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THE May Number of American Homes and Cardens in devoted to the small house, in building, its decoration, and its firmshing. This same contains a visit meaning in the same and the same contains a visit meaning and the same and the same contains a visit meaning and the same has been to bring out the charm of the simple beautiful things which control the thouse of the same contains the same contains the same contains the containst the thouse-counter but which cannot be explained without the same as one of a competent expert. It will elia him low to select the country at how to place the transact rooms of the house should be planned, the material of which it may be built, the land of planning futures to be used, the choice of hanging for the walk, doors and wandows, appropriate furniture for the various rooms of the house, and how to lay out the ground about the house as well as to the platting of them. Begiesel these departments the magazine will contain a host of articles that must inevitably stimulate the desire from home supervented.

Modern Houses from the Atlantic to the Parific Ideas for Colonial Furrishing Home Built Garden Seats and Pergolas

The Fifth Fire Garden of the American Homes and Garden Competion
The Modern Low Priced Automobile
The Alteration of the Colors of Flowers by Cultivation

The Out-of-door Living-room

Trees and Shrubs to Avoid in General Planting

mitted in seeds case. Indeed, many of any most seed of the seeds of th

or less perfect vacuum. I like the old fashioned cupping glass the well known toy known as the 'sucker,' reminds us of the octopus By means of the sucker —a small circle of moist leather with a d-large stones may string attache lifted in exactly the same manner that lifted in exactly the salte manner con-the octopus dislodges rocks or holds down its struggling prey That compara-tively modern invention the pneumatic peg is an almost identical device peg is an almost identical device. The apex of the peg is fitted with a sort of a cup made of Indis rubber. When this is pressed upon a smooth flat surface, such as a pane of glass the air is forced out of the cup and a vacuum formed. The pressure of the atmosphere then causes the cup to adher to the glass with aufficient force to enable objects to be suspended from the peg. Further the man who had studied the octopus

might have added to the inventions at

atmosphere and the creation of a more

might have added to the inventions ai-ready enumerated, that of the common pump, which raises water simply by the action of the atmosphere That well-known device, the ball-andsocket joint without which many of our instruments and tools would be clumsy and impracticable, has many prototypes in Nature Perhaps the most familiar of these is seen in the articulation of the human shoulder bones—or, indeed in the bones of many unimals for the marvel ous flexibility of the snake is rendered possible only because the vertebra of this reptile constitute a long chain of balls and sockets beautifully adjusted one to the other Another very perfect exam-ple of ball-and-socket movement is found pie of oan-ana-socket movement is round in the case of the sea urehin Bach of the spines with which the shell of this creature is covered is swollen at the base into a cup-like form and this cup fits accurately upon a little rounded promi sence of the shell, which exactly fits into the cup just as the ball of the human the cup just as the ball of the human high bone fits into the acctabulum. The legs of insects in their articulation to the body supply examples of the ball-and socket principle too numerous to men

The idea of the flask or bottle is emi nently natural—I e it has played a part in the economy of Nature from time im examples are to be found in the vegetable kingdom among the plants known as gourds, the seed vessels of which assume forms calculated to remind the least imaginative individual of antique pot

We have already seen that the theory of the common pump might have formu lated itself in the mind of man after he the octopus There is moreover a pro-totype in Nature for that far more complicated device known as the force-pump This prototype is the human heart Anatomists agree that it is constructed on principles which are marvelously upto-date. In an incredibly short period the whole of the blood in the human hody passes to the heart and is driven from it again with a force which carries the stream to the tips of the fingers and toes, while as everyone knows the action of the heart persists, night and day, throughout the whole life of a man

throughout the whole life or a man a we regard the heart as the prototype of force-pump wrought in metal by the hands of mankind we must still be impressed by its immeasurable superfority its renovation and repairs are affected while the mechanism is in rapid motion. The simplest form of sewing is that which is in vogue among such primitive races as the Eskimos and Kaffirs It con sists in boring holes through the material sists in boring holes through the material which is to be joined together and push-ing the thread through them. The reader will observe that the operation is of so rough-and ready a character that no nee-dle is required, and one is almost tempted to imagine that mankind might actu ally have copied this method of sewing from having observed the manner in which the tailor bird constructs its nest

25:03

the pocket like receptacie thus formed in method the working scale that it is method the working scale that the sharp-pointed back is used to form a silt or hole in the leaf, and through this spices of tough grass, or other vegetable fiber, is passed A second hole is made and the natural "threed" is drawn through it, and so on until the work is completed by a tucking in and adjustment of unruly ends fibouid the reader completed by a tucking in and adjustment of unruly ends fibouid the reader and the state of the state o

also their prototypes in Nature The ma jority of nest-building birds exhibit a ore or less strongly marked weaving stinct. This instinct is most strongly developed in the case of a genus of finchlike birds indigenous to the warmer parts of Asia and Africa The spinning of fine threads so as to form thickor strands and the combination of these inwebs, are operations characteristic of many insects and their ailies Many spiders, as everyone knows, construct sliken webs which they employ as a means of capturing their prey, or of protecting their egg-clusters from injury But it is among insects of the sub-order Heterogram has been brought to the highest state of tice be termed the first spinners tice be termed the nist spinners—the in ventors under the guiding hand of Nature of this invaluable art. Take, for example, the cocoon of the well-known Cecropia moth—the so-called American silkworm It is entirely constructed of silk, which is secreted by glands in the mouth of the grub or caterpillar As soon as the insect me full-fed, and is about to pu pate, it sets about the formation of cocoon and labors unceasingly until it is The exact method of construction is so intricate that considers tions of space forbid us to describ detail. Suffice it to say that the pillar first constructs of sliken threads a kind of scaffolding, or framework, and then-laboring from within-goes to and fro about the skeleton structure deposit-ing its endiess sliken thread by means of a figure of eight movement of its head in this way a kind of tent of marvelous toughness is built up, wherein the cater-pillar changes to a chrysalis and passes andely through the quiescent period of its adult moth

and the reader may be reminded that many kinds of caterpliars contrive a kind of trap at the month of their comes similar in principle to those made by man for the capture of crabs, lobaters, and cels Within the neck of the Respect Moth's exceen, for example, there is a conteal arrangement of tooth, bristly appendages which form a well-nigh time penetrable barrangement of tooth, bristly appendages which form a well-nigh time penetrable barriangement of the states of camules which may attempt to force an extrance from without Yet owing to the feedbling of the community of these appendages, the fully civiliar of the cocons with perceive that the may not of the cocons with perceive that the trap of a moth's or the familiar lobaterpoid—a device which is employed by fahermen in many parts of the world to well as the second of the world as the second of the world as the second of the world of th

The writer is not sware whether Neture's contrivance of a box that cannot rell off a shelf has ever been put to pracical use by mankind it is obvious, however, that such a device might very well form the bests of more than one well form the bests of more than one well form the bests of more than one be studied by all those who are able to wist the rockly ledges used by sea fowl as breeding places—or, indeed, by those (Constituced on sepace Size











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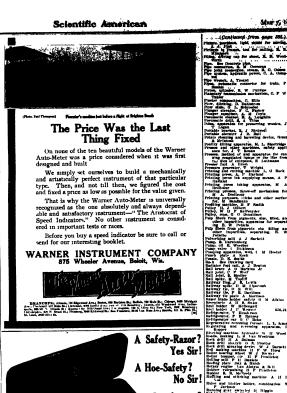


(Continued from page 185)
who care to experiment with the exp of these birds on an ordinary shelf or table If one sets a fowlarge rolling on a table, the odds are in favor of its falling to the ground. Not so however, with the eggs of leider frequenting sea birds. For the forms of these eggs are designed so carefully by Auture, that it is virtually impossible to impart to them any but a civil air movement. If disturbed these eggs roll round and round until the impartang that to them he sepended. It is warroly necessary to ditting upon the importance of this de-If one sets a fowls egg rolling dilate upon the importance of this vice inasmuch as such eggs, being laid on the narrow ledges of perpendicular rocks would-but for their peculiar form be precipitated into the sea upor for their peculiar slightest movement of the parent As it is careful observers have pird As it is caretin observers nave stated that although there is a constant coming and koing among the birds and a constant rotation on the part of the

ggs not one of the latter is dislodged The stings and mouth parts of insorts typify in many ways the devices and inventions of man. The sting of a hour part of a hou ventions of man. The sting of a bee or a wasp might well have been taken as a model of the modern hypodermic syringe, so too, might the claborate ar rangement of blades and saws by means rangement of blades and saws by means of which the female mosquito makes and enlarges her puncture. The instru-ments, fitted together and working in unison, form a tube through which the insect sucks the blood from her victum and incidentally inculates him with malarial fever The several parts of this instrument are shown modeled on a greatly magnified scale in the accom panying photograph The fact that the a sheath when not actually in use is of especial interest, for herein we see typi fied the sheath or scabbard by means of which mankind protects the keenness of his edged tools and weapons A still more perfect type of the hypodermic syringe is the fang of a poisonous snake When the reptile makes its stroke, the base of the fang is driven against a reser voir with the result that the liquid poison voir with the rault that the joint possess is driven through the tubular fang and forced into the wound. Even in the case of large snakes, these deadly weapons are surprisingly slender and delicate, so that the wounds made by them would be quite inconsiderable were it not for the fact that a deadly liquid is injected-exactly as is the case with the hypoder

mic syringo
There are many natural devices by
means of which plants and animals travel through the air and mankind is at travi through the air and mankini is are present engaged in a close study of these with a view to perfecting his own air ships and flying machines. The creatures whose appearance and habits resemble balloons most closely are the so-called globe fishers of tropical areas For the most part their bodies are covered with strong spines, or at least with hard plates, but the strangest characteristic of these ocean dwellers is their power of dilating the gullet with air, w body swells out into a globe-like form and the spines are erected, furnishing a formidable protection When so inflated, globe fish are unable to swim They drift about upon the surface with underside turned upward, and skim over the waves impelled by the passing over the waves impelled by the passing breeze. It cannot be doubted that this singular habit reminiscent of the bal loon is beneficial to these fish in that it enables them to escape the onslaught of sharks and allied carnivorous crea tures of the deep

in conclusion, we may glance for a moment at Nature's own electric batter less—two remarkable examples of the capacity of animal structure to produce electricity to store it so to speak, and to discharge it at will Both these crea tures are fish one belonging to the sel tribe, the other bing a species of may known as the torpede fish. As a matter of fact the torpede rays belong to several species which are met with in the Allan (Concluded on page 187)





Printing press inking apparatus, M. A. Tritaling press, threw-off mechanism for, fritaling press, threw-off mechanism for, fritaling press, and fritaling property of the prop Fig. 1. The content of the content o guisting and reversing appearant. West-legges with the second of the se Haffling and "strictling mention. A II to Rate," and the bester, considerable and the strictling for the strictling stric 955 879 166 873 955 949 956, 437 956, 196 955 978 955 978 956, 406 956, 822 904,490 105 843 958 300 906 900 906,962

. (Concluded from page 386) tie, Mediterranean and Indian Oceans. The broad, smooth body has a rounded outline, and on each side of the head outline, and on each side of the head there is an electric organ capable of giv-ing electric shocks. The accompanying illustration shows one of these fish dissected to show the seat of its electric power On the left, the nerves supplying the organ are dissected away The prismatic areas on the surface of the organ indicate the vertical columns of electrical plates, of which there may be 500,000 in each organ. The arrangement of these plates, or disks, is like the metallic por tions of the voltaic pile while each is separated from its neighbor by a delicate mbrane, which takes the place of the to be to enable the torpedo ray appears to be to enable the creature to secure its prey either by killing it, or rendering it temporarily insensible—it is said that just before the shock is delivered, the eves are depressed in the head like those of a toad when swallowing a large in-

The electric eet of Southern America stimes attains a length of six feet, and its electric organs are proportionate by four times as large as those of the wrped when about to deliver its shock & points its body in the direction of the intended victim, stiffens itself and with a sort of shudder, the electric fluid is emitted. It is said that the flah which is the object of the discharge rarely or never escapes but simultaneously with the shudder of the sel turns on its back and lies motionless—an easy prey to the electric monster

It would be possible to dilate at much greater length upon the natural proto-types of human inventions. Enough has been penned, however, to show how fre quently man's thoughts reflect the de quenty mans thoughns reflect the de-vices which aiready exist in organic na ture. The moral to this should not be far to seek. If so many existing hu man invontions have been anticipated by Nature, we may conclude that with Na ture lie the secrets of inventions yet to come, nor can it be doubted that a close study of animal and plant life will from time to time bear fruit in the form of mechanical devices which will prove of inestimable value to mankind at large for this reason, if for no other, the in rulcation of Nature study in the minds of young people is highly desirable

### THE MICE AVIATION MEET.

(Concluded from page 372) made but one stop, at Litchfield started readily from that place at 4 09 A M and covered the remaining 68 miles in 1 hour and 21 minutes beating the train that accompanied him. The last 24 miles were flown in 24 minutes on account of a favorable wind. Bight thousand people are reported to have watched him arrive d the remaining 68 miles in and to have given him a rousing wel

Next to the Biériot Latham race across the English Channel last July, this cross-country flight is the greatest achievement so far in aviation In the light of what has already been accomplished it would seem that from 800- to 1,000-mile flights without a stop for fuel are now quite sible of accomplishment the only limiting factor being human endurance both his attempts at flying from Lond both his attempts at flying from London to Manchestre Graham White was obliged to give up on account of the great strain undergone by him in maintaining the equilibrium of his biplane in the strong and gusty wind When some device is provided which will maintain equilibrium automatically, the strain equilibrium automatically, the strain upon the aviator will be greatly relieved and driving an aeroplane will then be no more fatiguing than running an auto-

Sicostive powder is prepared by mix-ing 30 parts of lithopone, 30 of sine-white and 40 of manganese borats. Past the whole through a fine steve. This pow-der is a good drier for white paints.



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or obstruction of any kind naturally offers more resistance to the low than to the high wheel In plain language, the low wheels must jump over—the high wheels roll over That's one big advantage of than to the man wheels roll over That's one big advantage or high wheels It means not only greater comfort but less jar and jolt to the working parts of the car That is why the I C H Auto-

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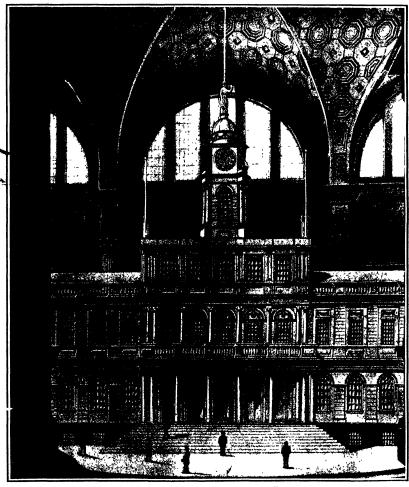




## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. ( II -No 20 | Established 1915 NEW YORK, MAY 14 1910

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Interior view of the magnificent waiting room which is so spaceous that it could contain, bodily, the New York City Hall. The ceiling, 150 feet above the floor, would clear the flagpole by 10 feet.

## SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. Inc. Editors and Proprietor

Published Weekly at No 361 Brondway New York

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NEW YORK SATURDAY MAY 14th, 1910

The Editor is always, and to receive for examination illustrated arise as spherits of numero moreous. If the photocraphe are source the arise short and the facts authentic the contributions will receive specialistic on with legal of receiving specialistics with legal of receiving specialistics with legal of receiving specialistics. NEW QUEBEC BRIDGE DESIGN

CCORDING to a recent dispatch to one of the New York dailies the Queber Bridge Board after extended investigation has approved a plan for the superstructure of a cantilever to take the place of the one which collapsed severally care sage it is also amounced that tenders for construction will be accepted either on this design or on satisfactory alternative designs submitted by bidders. It is stated furthermore that the Dominion bidders. It is stated furthermore that the Dominion government will require not only that the contracting

firm accept full responsibility for the project whether it be constructed on the Board's design or from its own plans, but also that the firm make a very large cash deposit as guarantee of successful compl

The design now approved by the Commission The design now approved by the Commission says the dispatch is that which was sharply criticised a few months ago in an American selentific periodical", and we are informed in this connection that the Cana-dian government has desided that the criticism then made did not justly apply. We are further told that "the Board while convinced that the designs will make

a safe and satisfactory bridge is not disposed to close

e door to other designs.
Since the Scientiff American is the only jour that has printed the plan of the new design drawn up by the Board and subjected it to extended criticism we presume that we are the American scientific periodical referred to. The plan and discussion was printed in our issue of February 12th, and our readers will remember that we took exception to the design on the ground that it was not only of inferior merit consid ered from the bridge engineers standpoint, but that if constructed it would be the 'ugliest bridge of monu If constructed it would be the "uglete bridge of mount mental proportions among those hilberts proposed or built. Objection was also made to the design on the ground that be same of its narrow width it would not have sufficient rigidity the Forth bridge, which is of loss again, having a ratio of width to length of 1 to 14 whereas the Quebec bridge would have a ratio of only 1 to 20. We objected further more, to the height of the towers, which in the Barri's design in to be only 20 feet as against a beart's design in to be only 20 feet as against a col of 140 feet in the Forth bridge. We showed she that the effect of low height and narrow width lean to unduly increase the weight of the structure of Quebe bridge requiring the resonance average the Queber bridge requiring the enormous average weight of 24 (one of steel (half of it nickel steel) per linear foot as against a weight of only 10 tons of carbon steel per linear foot in the Forth bridge—an increase out of all proportion to the heavier loading of the proposed Quebec structure
The value of the Board's decision to invite outside

designs depends upon the length of time that is sllowed to bidders for the proper preparation of plans for a structure of this great importance. The Board for a structure of this great importance. The Board has laken about low years to prepare its own plan, and if outside bidders are to be limited to a few mompha time it is searchy likely in view of the heavy penalties imposed that they would be prepared to put his bid with his properties in the property of the property of the property of the property of the competition to be thrown to getter very hearity. If the competition to be thrown one to the definition and mirridge builders of the United States and Europe not only should abundance of time be given for the working up of the necessar plans and estimates, but it would be advisable for the plans and estimaton, but it would be advisable for the Canadian government to arrange for the plans, both of the Quebec Bridge Board and of outside bidders, to be subjected to the award of an independent Board, pre terming international in character YURL ROOMOMY AND OUR NATURAL RESOURCES

IE problem of preserving the natural wealth of the country may be attacked from two sides, the legislative and the mechanical. The operation of the first method may be seen in the admirable movement of the Federal govern ment to prevent the ruthless waste of the country's ment to prevent the ruthless waste of the country a matural resources which results from the improvident methods by which they are gathered from mine, field, and forest Only posterity will be able to estimate at its full value the revent legislation for the conserva-tion of that natural availth with which the United

States has been so richly endowed

But after the fostering care of the government has done all that it may to conserve by the prevention of waste it remains for the consumer to so utilise the raw materials, as to obtain from them the maximum raw materials, as to obtain from item to maximum amount of meful output, whether in the form of power or of finished product, with the least possible amount of wastage. This indeed, is one of the most impor-tant and attractive objects of effort in the great industrial world. To the engineer of high professional in stincts it is not sufficient to do a certain work and do it fairly well, rather, it must be done with as close an approximation to perfection as the conditions of

Economy of performance has been the constant aim of the industrial engineer, particularly in recent years, and from time to time we have recorded in these pages (crisin successive steps some of them epoch making in their importance in this constant on deavor to bring working efficiency into closer approxi mation to theoretical efficiency. What we have said applies with particular force in the field of steam en gincering in which it may be said that at the last analysis the object of all improvements is to lessen consumption of fuel for a given amount of work. Fuel economy, moreover apart from its direct connection with the profit and loss account of any industrial enter prise has a most important bearing upon the ques of the conservation of natural resources tion of the conservation of natural pressures. The world's coal supplies are by no means unfillmed. The consumption entering at an acceptant part is not every reduction that is made in the average amount of fuel which must be burned to sever a given amount of sort we mean that the life of our coal and oil fields is prolonged to existly that start.

At the present time there are two important develop ents which promise to give economical results whose cases they have to do with the transportation of freight in bulk, the one relating to the engines of slow speed cargo beats the other in the motive power of those freight frains which are so characteristic

The reduction in the cost of transporting water horne freight has been made possible, or soon will be by the successful application of mechanical reduction gear to cargo ships of moderate speed—a problem to which some of the ablest engineers and the most renowned manufacturing firms in the world are now do voting close attention. MacFarland and McAlpine, and Westinghouse, in this country, and the Hon. Charles Westinghouse, in this country, and the Hon Charles Parsons in England has indeependently produced a gear which will enable slow and moderate-speed steam ships to utilize the highly co-commital fast running stram turbine for driving slow-speed projection with a loss of efficiency in the transmission pear of only two per cent. Parsons has gone so for as to test the new installation against the old reciprocating regation, in a cargo ship of 4 500 tons displacement, and he has proved in a series of comparative tests that the cargo ship of the future can be driven at present speeds with a saving in the coal bill of from 17 to 20 per cent Now since about two thirds of the world's shipping are made up of freight steamers, it can be seen that when some form of this system has been generally applied, as it undoubtedly will be, there will be a great aggre reduction in the consumption of fuel by the world's merchant marine For fuller information re-garding this epoch making device, reference is made to articles published in the SCIENTIFIC AMERICAN OF Feb-

articles published in the Scientific Aurenta of Ph-roary Talk and April 23rd of this year Gousily important are the economies in the trans-portation of rained freight which are now rendered possible by the perfection of appliances for the use of superheated internal Although the application of super-heat has been practicated for several years in Surope, the of the perfection of the perfect of the per-turbation of the perfect of the perfect of the per-turbation of the perfect of the perfect of the per-turbation of the perfect of the perfect of the per-turbation of the perfect of the perfect of the per-turbation of the perfect of the perfect of the per-pendicular perfect of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-turbation of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-turbation of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the per-turbation of the perfect of the perfect of the per-pendicular perfect of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the perfect of the per-pendicular perfect of the perfect of the perfect of the per-pendicular perfect of the perfect of the per-turbation of the perfect of the perfect of the perfect of the per-turbation of the perfect of the perfect of the perfect of the perfect of the per-pendicular perfect of the perfect of the perfect of the perfect of the p good work that on one of our leading western roads, the Atchison Topeka and Santa Fe, superheated steam is being used on a number of the largest freight enin being used on a number of the harpest freight ca-pines with conspicuous success in a series of tests with two identical compound freight shighes running over the same stresh of read under identical condi-tions, one a 4-rylinder compound using entrysale rican, and the other a similar drylinder compound with a superheaster of the Jacobs type added, the rapper-heater sugine showed a decrease in coal, consumplied of 196 per cent for constant hard working on heavy of 19 8 per cent for constant hard working on heavy mountain grades; it gare an average of 11 6 per cent more dry steam per pound of coal than the non-super-bator engine, and the boiler and its accessories proved to have a total blather efficiency of 138 per cent. These figures were obtained by it MacPartand, the engineer of tests of the rational who explains the remarkable recommiss secured by the faute First, that superbested steam of high temperatures behaves addentified and the superbest of the superbest of the super-siderable, amount of, thest, before any conference in siderable amount of heat before any condensation takes place, secondly, that for the same cut-off in the value place, secondry task for the same culton in the vylinder, the weight of steam required is less with superheated than saturated steam of the same pres-sure, and thirdly, that, as compared with saturated steam superheated steam has greatly reduced thermo-conductivity, and the amount of heat absorbed by the cylinder walls is only a fraction of what it would be were the steam saturated. The details of this system of superheating as applied to locomotives of the Mallet will be fo und in an illustrated article published in our issue of January 29th of the present year

in our issue of January 29th of the present year.

Important as are the economies that have been under

possible in the broad field of transportation, they are

exceeded in the even larger field of stationary engineer

fing represented by the huge light and power plants

for municipal and manufacturing service where the utilization of the exhaust steam in low-pressure tur-bines has made possible economies of from 30 to 100 per cent-this last result having been attained at the rge station which furnishes power for the New York

DOTE RADIUM RESET IN THE PURE STATE !

HK French scientist G Le Bon doubts whether metallic radium exists In fact, we are only acquainted with the saits of the suppo metal such as the chloride or bromide the probability of its existence is deduced only from the presence of some rays of the spectrum and an atomic weight which is somewhat theoretical seeing atomic weight which is somewhat theoretical seeing that It has varied according to the observers. M. Le Bon has been of the nylmion for eight years past that the existence of radium is doubtful. He considers that the properties of the supposed metal might be due to certain unknown combinations analogous to the equally unknown combinations which give phos phorescence to some of the sulphides. It is observed phorescence to some of the sulphides. It is observed in fact that a jurie sulphide is never phosphorescent, but when mixed with some traces of different bodies in becomes brilliantly phosphorescent. This point has been discussed in various papers presented to the Academie des Sciences. If has do casion to mention has views about radium to the late Prior Moisson, and this well known the bright had not be suited to the same the prior of the surface of th conclusion, having the idea of separating radium from its compounds. Death overtook him before he could carry out these researches. A tenth of a graugue of substance would be needed by a good chemist, but probably several operations would be required in addition An expense of \$10,000 would be incurred Mile Bon thinks that from chloride of radium we would extract simply barium and nothing more. The ex-periment, even through transforming a body worth perfinent, who turough transforming a looy wound \$200000 a granume into a comparatively worthlose notal would be of great interest, for it would prove that radio-activity which gives out considerable force can be produced by certain combinations

M Georges Claude of Paris brings out the follow ing points regarding the future uses of oxygen, see ing that this latter is now being produced on a countercial scale from liquid air. He shows that oxygen can increase by 40 per cent the yield of the reactions which serve as the base of the fixation of nitrogen by the olectric are, and it can improve the magnifecture of oxone by nearly 300 per cent. Buth results promise to be of great interest in many of the industries. The Balgian firm of Ougree Marihaye has revently ordered from the Paris Liquid Air Company three apparatus from the Paris Liquid Air Company three appearatus for producing oxygen, and these such have a yield of 500 cubic yards of pure oxygen per hour. Such appearatus will be used for experiments in blast furnace working, to observe the action of a considerable province of oxygen mixed with the sight which is sent purposed to the period of the period oxygen appearatus of the places. He was not to using expen appearatus of the places that only the period oxygen appearatus of the places. where the may could upon a pyratus of the present kind and we may could upon a piece of 040 cent per cubic yard with apparatus of a large output such as we mention However, even larger apparatus on the belit in which to loss than 1,000 cubic yards of mas jecin which no less than 1,000 cubic yards of ma jet hour can be produced, working at a pressure of the hour can be produced, working at a pressure of the atmosphered and furnishing 1.5 males seek the price per cable yardwill fall as jew at 8.5 cept. By using hybridgh given will fall as jew at 8.5 cept. By using hybridgh given the cost of production, sits a left; lowered. Degree plants of the pressing fixed will be of great advantage in the way of manife these companies on the production of the p

## "SCHOOLING TANKS ICAN

## ENGINEEMAG

The German estimate of agromatical statistics for the year 1810 is that German will have fourteen dirigibles and five acceptance; France, awon dirigibles and twenty-nine aeroplanes; Italy, three dirigibles and eagren aeroplanes, Russia, three dirigibles and six aeroplanes fingland, two machines of each kind

The activity in railroad construction in the North wost is nanvership for the construction of several in persant bridges across the larger rivers. A notable in stance of this is the Colombia River bridges across the North Coast Railway is Washington the permanent substructure of which will consist of twelve percarging a superstructure made up of nike Hose trust again, and a few span across the main channel.

A leading southers journal speaks worst or wisdom has it says that the policy of may yard construction of hastischips should be adhered to, even if it costs a triffs more than building in private yards Kesping our leading navy yards busy with warship con attruction not only serves as a simulus to private con struction to only serves as a simulus to private con traction, but it has the important effect of maintaining the party yard forces intact, with a large body of skilled workness ready at all times to undertake convergency work.

The loss of the Atlantic transport liner "Minneshah" upon the nuchdreaded recks at the vestment was the supplier of the Atlantic and the perison of the perison of the search atlantic navigation to the perison of the search atlantic navigation of the perison of the submarine bell on our Atlantic constances of the submarine bell on our Atlantic constances that this derive night be used to very offered at the more dangerous points at the approaches to the Brittlish of the Brittlis

Mobody seriously disputes the advantages of the hospital programmer. Paga-as were series' car. Not the least among the least and the the reduction which it has made at least on certain lines, in the number of actionist. Statistics compiled by the Chicago City Railway above that the complete introduction of this style of ser on all trust laterduction that the style of ser on all trust what previous accompany of the hospital programmer and the programmer of th

The building of railroads brough monutanous country or canoning increasities some during bridge con struction. A recent instance of this is the Assopus with duct which forces part of a new line extending by way of Dentitl to the Turkish frontier. The structure which is 800 feet long and apane a goog 330 feet operatives to connect tax tunnels which open from other side of the googs. The supersticture which is the grant of the structure structure is the structure of the structure structure with the structure stru

Recent tests at Sandy Hook of the resisting power or reinforced concere as a defense against high posered projectibes confirm the calculations of the penerating power of the twelve-into goal to sated that a concrete wall twenty feet thick heavily reinforced with steel beams, was pierced by a twelve-lesh projectile fired at high velocity. We understand that a simiar take it to be made with the new fourteemin's num. The blow delive red was sufficient to posterate out of the steel of the steel of the steel of the contrel's without the state of the steel of the penel of the steel of the steel of the steel of the day be used in the construction of the new coast defense fortification in the Philippine

The absentic operation of trains through the Saint Cair tunnel is showing the same encountes as rom pared with steam operation, as have been obtained in shaller installations observed according to the Riectic Railway Journal the roat of road for one year under electric operation was only thirty sine per year under electric operation was only thirty sine per year under electric operation was only thirty sine per total service charges were but altay per continue. The folial service charges were but altay per operating economy of the new over the old service. The cost of maintenance and repairs for the operating economy of the new over the old service. The cost of maintenance and repairs for the old strip of the same strip of the cost of the old of the control of the old of the same strip of the cost of the old of the old of the same strip of the cost of the old of the old of the same strip of the old of the old of the same strip of the old of th

Considerands interest has been aroused by the launch of the new torspeciosat destroyer "Paulding" at the Bath Iron Works She will be the first destroyer in curary designed for the acculative use of oil free! Except for this, she is practically a sister vessel to the "Flusher" and the Klands, and must make a speed of 18½ knots on a four houser read at the "Ratio", and like them she will be driven by tarkines, and must make a speed of 29½ knots on a four houser read at the "Ratio" made 84 knots recently in the Said Machine She and the "Ratio" and the size of the siz

### ELECTRICITY.

Vin Rochester, R. T., a good exprism of electric light and telephone viring its mas, whereby unsightly pole lines on the streets are done sway with The system is applicable childry to the residential districts. The lines are placed in underground conduits in the streets but instead of making connections with the houses directly from the underground conduits, a pole line is erected in the back yarde of each block and this solid line is in the latter of each block and this solid line is at each side street. This obvitates the necessity of having a mashabo in front of each house.

An application was recently made for a permit to any conducts along the new Hallitmer and Willings to recent a permit to the product and produ

Storage battery locomotives in being used in certain mines of Crimany. These locomotives are considered less damperous than the ordinary levish locomotive for the rason that no string is necessary in the mines and they can be incase of completely to present ignition of games by means of a chaine squark. The locomotives are each provided with two sits of hat tries one of which is being charged while the other is operating the locomotive. The batter has an addomner than two thirds dish harged with at the other large large dark the charging takes but a short time. In one type of locomotive of tworty horse-power the batteries contain ninery cells each with a capacity of 71 ampert, hours. The storage battery locomotive range from 8 to 52 horse storage battery locomotive range from 8 to 52 horse

Whenever a ablt message Is not to an Inland city, it is necessary to trans this the message from the table receiver and re-transmit it to hand over the land lines to its point of destination. Hereafore, it has been impossible to send a message direct to the hand city by mans of relay connection, with the overland wires for the reason that the sable sizes are of too fluctuating a thereafter and too smithly to operate an ordinary description of the same of the

The installation of a complete blephone system for the stage of the New Thesier in this city literative not only the variety of uses to which the telephone is put but also the vastness and complexity of the update stage. The stage telephone system has nine rist tions on the stage and twenty for floor stations with two switnishards or central stations. Through these centrals inter-communication with the other stations may be had. From one of these centrals inter-communication with the other stations may be had. From one of these centrals interested in the station may be had. From one of these central stations while the other board is the stage manager station. The regular stations are placed in the purpose attain. The regular stations are placed in the post of the station that the station is the stage station and the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system of the central stations and they serve to flesh is bull-system.

The Pennayiwala's tansed and terminal signal in stallation is the largest single installation of its kind ever made in this country. While most people realize that signals juy an important part in protecting train movements especially where traffic is congested, the investment made in these devices is far beyond the general understanding. Development in signaling in event years has been tremendous and has proceeded chiefly along electrical lines. Complete signaling and the signal control of the signal signal

### SCIENCE.

Prof. W. W. O. mpbill, director of the Lick Milery atory, has telegraphed to Harvard College Observators, that the bright sedium D line has been photographed in the spectrum of Halley a count by Wright.

Prof. Charles Chandler was honored in New York Sity recently on his retirement in his 74th year from approxservies—A banquet was tendered him at the Waldorf Astoria hotel. The banquet was attended by many of New Yorks most distinguished setentists.

Commander Peary's arrival in bendand was attended with much ceremony. A regiment of requesters much lim at Plymouth Members of the Royal Geographic call Society as well as the 1 ordion Navial Active welcomed him to London. With Commander Peary is tage Itaricia, who accompanied him to the public tage in the property of the property of the property of the Peary Brown of the Peary Pay the Royal Geographical Studies, and a replican subject to Capit Bartlett.

A later dated May led 1919 has been rectived at literact Other stater from 1970 D. W. Morehouse of Brake Lutversty, stating that. This morning at 6 crock fallay we come had a short bright tall projecting toward the sun. Two bright rave bordered ing toward the sun. Two bright rave bordered the non-training of about 86 degrees. The south preceding one was much the brighter. The notions was arrounded on the sun side with distinct notations should not the sun side with distinct notations should say the contraction of Cottober 1101 ISS was wishly recalled. A photograph of 11 influsive exposure showed a state of over 2 degrees in location.

The lowest atmospheric temperature erry observed, of 8 deg (\* 1 and deg F) was recorded on January 16th 1885 at Werkbolausk in Piastern Silteria a little morth of the Artic Circle. No lower temperature discussed in this has been experienced by any Artic to Antarctic expedition. A temperature of the separation of the expedition of the piastern of the separation of the degree of the separation of the degree of the separation of the cook who claims to have observed as importance of the degree (\* 1 degree of the degree

The United States Weather States has bound in stratum to all the region states calling for observations on the 17th 18th and 19th of May of any optical, extrain reasons the state of the states of the state of the states of the state has been associated by the associate of the state through the last of finish we closely formed. For other the divelopment of the stall has been disappointingly slow, and it may not extend so for associated to the state of the date of transits should it do not consider the state of the date of transits should it do not not state of the state

A monograph bearing the lift Quality of Surface Maters in the Inited States has been issued by he Inited States than been in Sued by the Inited States than been in Sued by the Inited States that the North of R B Dole contains the results of ever 5000 mineral analyses of water from the principal rivers of the Inited States cast of the May Monatains. Dails samples of water from nearly 200 Mantinus. Dails samples of water from nearly 200 Mantinus. Dails samples of water from nearly 200 Mantinus were collected for a year, untied in 100 so fen consecutive samples from the same stream and station and the composition subjected to analysts. The analyses giving as they do the average competition from day to day and information regarding thanks of water than the stream of water than the stream of water than the stream of the stream of water than the stream of the stre

During the past winter Prof Hermall of Straburg president of the International Committee and Relatifik Acroalities arrived out a series of daily selected the Acroalities are all out a series of daily over the Atlantic Ocean in the region between Therefile on the West Indies. The average altitude statistics which is the record for such observations at 1500 meters and the maximum 1,500 meters which is the record for such observations are such as the lowest temperature yet measured over the sea was also statistics of the 300 meters. In measured over the sea was also statistics of the 300 meters. It masses altitude of 500 meters is a season of 500 meters. Immediately above this had at an altitude of \$100 meters. Immediately above this had at an altitude of \$100 meters are violety of 30 to in meters per second time of warm after from the trouber to Eurone and the macental distraction of the season of the second of the

# The Porhydrometer—An Apparatus for Weighing Ship Cargoes

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

An ingenious apparatus has been perfected by an Italian engineer, Signor Emilio de Lorenzi, the func-tion of which is to indicate automatically the weight of a ship s cargo This device, which is called the "Poris of simple construction and operation hydrometer, and works with remarkable accuracy—the results be ing within 0 001 per cent Moreover, it is easy of in stallation so that vessels already in service can be equipped therewith as readily as those in course of construction

The operation of the instrument is based upon the principle that a body floating in a liquid no matter its density may be displaces a quantity of that liquid exactly equal to its own weight. The apparatus comprises merely a float or "aerometer" pla meter" placed in a with the outside of the ship Consequently, as the ves-sel stake desper into the water while being loaded or the treat when the freight is bring discharged, the level of the water in the float chamber must ris in coincidence with the level of the surrounding liquid The float itself being fixed it become or less deeply immersed in the water in the chamber with a consequent siteration in its apparent we

The accometer is connected and balanced by levers so that by the adjustment of the balancing weights the volume of water displaced by the aerometer at any particular draught is accurately gaged the alteration in apparent weight being read on the weighting machine or recording instrument and therefrom the weight of any cargo taken on board or discharged is easily deter

The principle of the apparatus may be more com chensively realized by reference to the explanatory ustration which shows the mid-ship section of a vessel with the porhydrometer in position. The float chamber A is placed vertically over the longitudina and transverse center of the ship and extends from a point 11/2 to 2 feet below the line of flotation wi el is empty to a convenient height above the load This chamber is connected to the surrounding liquid by means of a smaller pipe B to a valve on the skin of the vessel, or to some other convenient ses water connection a special tube being unnecessary so long as an uninterrupted flow of water to the float chamber can be secured so that the water level within may be exactly as that outside the ship In the large float chamber A is immersed the

aerometer C being suspended from. and balanced by a horizontal lever D having its fulcrum at E the end being connected to a steelyard weighing machine at F. The aerometer is generally made beavier than its displacement, but this is immaterial since it is in a condition of equilibrium. The float extends downward sufficiently to bring its lower end below the plane of flutation for light leading and sufficiently far upward to bring its upper end above the plane for the maximum draught. Moreover, its profile is such that the area of the float at any point of cross section bears a constant ratio to the area of the ship at the same level
As the vessel becomes immersed

through the superimposition of any weight such as cargo, the draught increases and accordingly the wa ter in the float chamber rises to a higher level the secometer itself consequently being immersed deeper into the water, and by increasing its displacement reduces its appar ent weight as already mentic This difference of weight creates a downward pull on the opposing arm of the lever, where a counterweight remains unaitered As the steel yard is connected to the main lever

D by the rods or links the exact

amount of tension is registered that
is attributable to the disturbance of the balance on the main lever through the increased displacement.

The vital part of the invention lies in the acrometer Alteration of trim or inclination of the vessel cannot by any means upset the ac curacy of the instrument It to to short an absolute gage of the ves be placed right aft or forward will be weighed exactly the same as

ed near the center of the vessel, since the draught directly under the instrum urrugan surrectly unger ton maximum at the mean of that fore and aft. The whole of the parts of the apparatus are standardised with the exception of the acrometer, which must be properly designed and care-fully adjusted. Its form being made to correspond with that of the ship

us tests with the apparatus have been car ried out in England, and the accuracy of the weight readings, irrespective of the size of the vessel, have been remarkably conclusive It can be applied to



Recording instrument of the perbydrometer.

any type of craft with equal facility and infallibility— to a small lighter as easily as to a transatiantic liner At the present moment arrangements are being made for its installation upon a 10 000-ton vessel. In this case the diameter of the float will be about 9 inches case the diameter of the float will be about 9 inches For a small lighter it averages about 3½ inches diameter it the top by about 2½ inches at the lower extremity. So sensitive is the apparatus that it will indicate the weight of a person stepping on board

Thus it will be seen that the captain of a vessel always possesses a means of determining exactly the weight he has on board For those vessels engaged weight he has on board. For those vessels engaged in long journeys, necessifining bunkering at intermedial are ports, it is of far reaching importance, since it cables the capitain to sacertain precisely how much fuel he has shipped. This is a valuable point, has-much as at many foreign ports short weighting is by no means an uncommon practice, and vegsels are often mulcted for a considerable sum per annum in pay ments for misrepresented quantities of coal

The function of the invention is also carried to a further and important feature. It will inform the captain the exact weight of water he has in his ballast tanks. Also, should the vesed spring a leak the fact is instantly communicated to the captain by the apparatus registering an increased ment due to filling with water. In cases of collision and grounding the incursion of water is similarly con and grounding has incurrent of variety of statistics, veryed, the apparatus being equipped with an electric alarm bell, which conveys intimation of the danger to the captain. No discrepancies in the readings can be introduced by variations in the density of the water in which the vessel may be floating, for such cannot affect the fundamental principle upon which the ap-

It will be seen that by the introduction of the ap-It will be seen that by the introduction of the ap-paratus the ship itself is practically converted into a huge weigh bridge. The Italian government submitted the invention to searching tests and was so convinced. of the accuracy of the records that its customs authori-ties have been ordered to accept porhydrometer readings as correct. To the shipowner this is no slight ncession, since in regard to Italy, instead of paying 45 cents per ton in weighing dues, vessels fitted with the porhydrometer only pay 1 25 cents per ton

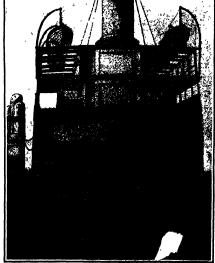
## uence of Phase and Retation upon the Brightness of Hiluminated Spheres,

The total luminosity of the moon varies accor to the proportion of its illuminated hemisphere which ed toward the earth, that is to say, in acco ance with the "phase" of the satellite. Mercury and Venus show similar, but smaller differences of phase and brightness. The exterior planets vary in phase so little that the variation in their brightness is barely perceptible The brightness of planets can be measured by the astrophotometer, and the dependence of the brightness upon the phase can be expressed by a As it seemed possible that some information in regard to the surface of the planets could be ob tained from the study of such curves, Von Aufsess has made a series of experiments to determine the relation etween brightness and phase in the case of illumin ated masses of limestone, sandstone, granite, and other materials of spherical and other forms The measure ments of brightness were made in a completely dark The artificial plant was illuminated by a h

lamp, not directly, but by reflec-tion from a plane sheet of glass, through which the object could be observed in the "full" phase The lamp and the reflector were mounted on an arm which could be turned around the object in order to vary the phase

When the results were plotted, the curves representing the bright-ness as a function of the phase were found to fall into two classes, according to the character of the material to which the globes were composed Globes of light colored material gave curves concave be-low, while the curves produced by globes of darker material are concave above Small elevations and depressions, glossy surfaces, etc., were found to produce comparatively little effect upon the curves, the character of which was, in general, decided almost entirely by the lightness or darkness of the sur-face. The curves produced by Venus and the moon are concave venus and the moon are concave above. Hence it appears probable that the surfaces of these two planets are formed of dark colored material—Prometheus.

In a recent issue of Nature the difficulty experienced in hot coun-tries in keeping small accumulatries in keeping small accumula-tors in working order is referred to, and it is pointed out that this is probably due to the cells being filled with dilute acid of deastly 1190 at a temperature of 20 des, or 35 deg Cent. While this is a proper density to use in a climate where the temperature is 15 deg.
to 20 deg. Cent., corresponding to
a 20 per cent mixture, it is too
high for a hot climate, where it
really represents a 23 per cent
mixture; a density of 1.176 or



Sectional drawing of vessel, showing perhydrometer. THE PORNTOROUSTER—AN APPARATUS FOR WEIGHTING AND GARGOUS.

## THE REW MITTEL PROPOSESPIED VALUE AND

hr secures perms.

Beagues, in order to measure the luminosity of the sun's disk, allowed a beam of sunlight to enter a dark room through a small sperture, below which a converging less was placed. The diverging cone of rays, beyond the focus of the less, was ing come of rays, beyond the locus or the lens, was intercepted by a screen, forming a circle, the bright-ness of which was not too great to be measured by the ordinary methods. The brightness of the sun was assumed to bear the same ratio to that of sun was assumed to bear the same ratio to that or the circle on the screen that the area of the circle bore to that of the aperture through which the light entered. At a later date (1844) Fineau and Fon-cault employed the photographic process which cault employed the photographic process which had just been discovered by Deguerre to compare the brightness of the sun with that of artificial sources of light. The quantity of light received by a unit of area of the solar image formed at the focus of a telescope is proportional to the clear aperture of the object glass. Fixests and Fuscanti received the image of the sun on an incided plate of silver. In successive experiments they varied the aperture of the objective and regulated the the aperture of the objective and regulated the duration of the exposure so that the final tint assumed by the plate and, therefore, the quantity of allver totaled decomposed, was the same in each case. In this way they proved that the required inversely in proportion to the aperture of the objective In total chemical effect was found to be (within the range of extreme of the objective). The total chemical effect was found to be (within the range of extreme of the objective) to the way to the total chemical effect was found to be (within the range of extreme of the objective) to the range of the property of the transparent of the same apparent diameter, of the positive earbon of an elec-

diameter, of the positive carbon of an elecdiameter, of the positive carron or an elec-tric lamp, they proved that the chemical effect is proportional to the brightness of the source of light. This relation, how-ever, did not appear to extend indefinitely, for the quantity of silver reduced, which was at first proportional to the lens th of the exposure, tended toward a fixed limit

then the exposure, tended toward a fixed limit, when the exposure was greatly prolonged. In 1881 the great advance which had seen made in photography enabled Janssen to employ very sensitive plates, in which the total chemical effect remained proportional to the duration of exposure proportional to the duration of exposure within very wide limits Jordan devised a heliograph in the form of a perforated crilindrical box containing a sheet of ferro-prussiate paper, and Richard constructed another instrument based on the photo-

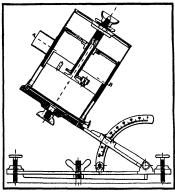
another instrument based on the photo-graphic action of the solar rays.

Campbell, on the other hand, made use of the heating effect of the solar rays for the purpose of measuring the effective an-nual duration of sunlight, I. e., the aggrenual duration of sunlight, i. e., the aggre-gate time during which the sun is not veiled by clouds, a quantity which plays an important part in the processes of vege-tation. Campbell's heliograph consists of a sphere of glass, mounted on a horisontal base, in a place exposed on every side, so that the

sun is visible from its rising until its setting. A groove in the spherical mounting allows the intro-



THE RIPPEL PROTOGRAPHIC HELIOGRAPH.



VERTICAL SECTION OF THE RIFFEL HELIOGRAPH.

duction of a strip of cardboard, which forms a circular arc at such a distance from the spherical glass lens that the image of the sun, formed by the lens, is

always on the strip The cardboard is carbonised by the concentrated solar rays at the spot where the image is formed and, owing to apparent diurnal of the sun a black line is traced on the card If the sun ablaces all day without inter-mission this line is continuous but If the solar rays are intercepted by feetling clouds the trac-consists of a number of separate portions the po-tions and lengths of which show when and hos-long the sun has shone. The apparatus is ceasily set up. If is nervesary only in level the base, i. i. places the non-line, marked XI on the rard oups-places the non-line, marked XI on the rard oupssite a fixed mark on the frame and to set the sate a nice mark on the frame and to see the in strument so that the sun's image fails exactly on this line at the instant of true noon. In the in proved form of the instrument designed by Stokes the frame has three grows, at different heights, in which three sorts of cards are placed. The shortest cards are placed in the highest groove and are used between November 5th and February 5th, the longest cards are placed in the lowest groove and are used between May 5th and August 5th, while the cards of intermediate length are placed in the middle groove and are used during the remainder of the year

Eiffel has recently invented a photographic re-cording heliograph which has been used for some time at the central meteorological bureau of France and at the Juvisy observatory It consists of a cylinder which is mounted on a shaft parallel to the earth's axis, and is turned

to the earth's axis, and is turned by clockwork at the rate of one revolution in twenty four hours. The sun's rays en tor the cylinder through an aperature in its convex surface which is surrounded by od for the exclusion of diffused light An inner cylinder, covered with photo-graphic paper, is supported by a nut which can move along the shaft of the outer cylinder which shaft hears a serew thread A guide, attached to the case of the clock work, prevents the inner cylinder from rotating. Hence as the outer cylinder turns, the inner cylinder is compelled, by turns, the inner cylinder is compelled, by the screw, nut and guide to more along the shaft without rotating. The photo-graphic paper is surrounded by a screen, which has various degrees of transpar the average intensity of sunlight at differ ent hours and seasons. As the outer cylin der rotates, its aperture is always directed approximately toward the sun and in consequence of the motions of the two cylin ders, the entering pencil of light traces a helicordal line on the paper which is wide enough to serve for a number of days. No sions (an be drawn from the photographic records made by the Effel heliograph until after the instrument has been in continuous operation for several

### GARDIN PROCESS OF PROTO-SCULPTURE.

The idea of employing photography as an aid to sculpture soon followed the in vention of the daguerrectype Fifty years ago Will ôme devised a process in which the sculptor's model was photographed simultaneously by twenty four

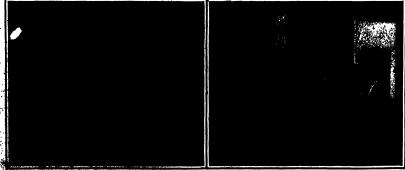


Fig. 1,-Cardin's apparatus for modeling from four photographs.

HALLEY'S COMET IN THE STREETS SET.

my many means notents, ret.s.

The average man will find by far his best opport The average man will find by far his best opportunity to see the comet, which has occupied so prominent a place in public attention, during the last ten days of May The accompanying map shows at a glance just what are the circumstances of its appearance. At first what are the circumstances of its appearance. At new its appearen motion among the stars is very rapid, but later, as it recedes from us, it seems to stand almost still in the sky . Its distance from the earth is in round numbers it million miles on the 20th. Tmillion on the 22th, 22 million on the 28th, and 45 million on the list, so that it will appear to shrink and grow visibly fainter from night to night,

grow visibly rancer rrow magns to mign.

In addition to the stars near the comist's path, and
the place of the compt for each night (at 10 P M
Eastern Standard Time, or P M Contral Standard
Time, etc.), the map shows the position of the horison among the stars at certain hours, so that it is
easy to estimate how high my they will appear at any time

The given position of the horizon is exact for

The given position of the horizon is exact for ob-servers in latitude 40 deg north (Pennsylvania, Ohlo, Illinoia, Utah, northern California). Those south of this line will see the stars on the right (on the map or in the sky) somewhat lower, and those on the left somewhat higher, at the same hour in any case it will be easy to identify them by the

y their relative positions.

Those unfamiliar with the constellations may well begin with the four brightest stars Regulus (at the end of the sickle-shaped group shown on the map), Castor and Pollux (close together), and Procyon late of Wight altersately mores forward and bush-ward with the wardsden of the tides, the greater pays serve of the water at high tide in the Buglish Chan-nel as compared with that in the Scient and Spin-hed canning the Island to be titled upward bothy from the channel pide.

This latest exportments in this direction have been

MAY 14, 1980.

from the channel side.

His laider experiments in this direction have been carried out in connection with the Irish Beas at the mouth of the Breezy. A special type of seismic recorder has been devised and has been set up in an underground position at Histonic Observatory near Liverpool, some two miles from the water's edge. The Apparatus comprises, as it were, a must and a boom, such as is used in the professorie extrustance recorders, the boom being free, so that as the mast moves in such as the contract of the professories of the contract the contract of the contract of the professories or another the boom can also move in such as the contract of the professories or another the boom can also move in such cases of the contract of the professories or another the boom can also move the contract of the professories or another the boom can also move the contract of the professories or another the boom can also move the contract of the professories or another the boom can also move the contract of the professories of the contract of the professories of t A photographic recorder is connected to the appear-tus so as to secure a permanent visual record of the oscillations. The instrument is far more samitive than that amployed for ordinary selemic operations, thereby indicating those very alight movements of the earth which the ordinary appearatus would ignore. The records secured by this instrument conclusively prove that twice every twenty-four hours the opposite sides of the tidal hash are drawn closer together, the

phenomena occurring at high tide when the incr phenomena occurring at high tide when he increased volume and weight of water piled up in the 1-rish Sea and pressing on its bed occuses the latter to asy com-what. The action can be watched, for when the tide is flowing quickly and the tide is high the pendulum moves a considerable distance and keeps pace with the deflection due to the increasing load. At Bidston the weight of the tide of the mouth of the Mersey causes a deflection of about one causes a deflection of about one that he is defined to distance of stream

miles. As the tide ebbs and the weight is reduced the mag dimin ishes like a dent in an India rub ber ball, and the banks on either side slowly recede from one an-other. The extent of this attracting and repelling movement would be more accentuated upon the instrument were the latter ed nearer the sea, and Prot. placed nearer the sea, and Prod. Miline points out that for this reason observatories should not be situated too near tidewater. The regular alternate movements of the apparatus in opposite directions every six hours not only, as it wers, record the extent of the elasticity of the earth's crust, deministration of the classicity of the earth's crust, deministrations of the control of the classicity of the earth's crust, deministrations of the control of onstrating that it is responsive to pulls and strain to a far gre degree than is generally be-lieved, but also weigh the tide it-The result of these exp ments should provide a new field for investigating tidal forces and phenomena, and possibly contrib-



The Current Supplement. Almost the entire issue of the current Supplement, No. is devoted to a complete de 1793 tion of what is known as the New

York Tunnel Extension of the Pennsylvania Railroad, the contliest improvement ever made by a railroad, and one of the most far-reaching importance to industry and to the traveler. Many pictures are published, showing the excavations which were made, the progress of the work, as well as the were made, the progress of the work, as well as the completed station. Dr. Otto Hoffmann writes interactingly on the system of the universe. Carbon transcribedries possesses in comparison with carbon distribution possesses in comparison with a part of the possesses of the carbon distribution of the carbon dist

Recently Mr. W. Canney, of Lends, reed, a paper before the Richerham, Snathewirth Stockey on "Snathemering in the Richer Roses." Mr. Contemp related that there were an indication that the incotory shiftener would be repositanted by monchained dente there were an indication that the incotory shiftener would be repositanted by monchained dente than, as hid cost of qualitativing stream by rest mechanic was contracted out that white solid gages and water in the same product and the production had been plain in, tous, whitein had no manned contraction. At full contribution indicator had, herewise, been invested for this purpose, constituting a gage actuated by the draft of the chinque; and further a gardented some gripter the penale weight of a gage actuated by the draft of the chinque; and further a gardented some gripter the penale weight of the posted weight of the posted weight of the penale weight o

cumeras, arranged in a semicircle. A paper positive is made from each of the negatives and the twentyfour prints are cut out along the outline of the figure, and are then cut in two vertically The forty-eight profiles thus obtained are assembled radially about a profiles thus obtained are assembled radially about a vertical axis in their proper relative positions. By filling in the intervals with a plastic mass a fairly to sketch of the figure is obtained

complete sketch of the figure is obtained. This process may be varied as follows: A mass of clay or modeling was is placed on a revolving circular platform, the circumference of which is divided into twenty four equal parts. The approximate form of the model having been given to the mass by the usual methods, the notifice of the figure in one of the currier; photographs is followed with the tracking point of a pantograph, which is so constructed and point of a pantograph, which is so constructed and arranced that it couying point plows a furrow in a ranced that it is countried to the property of the one division and a second furrow is made from the accord photograph. This process is repeated with each of the twenty four photographs, and the clay between the turrows is carefully removed A very shillful hand is required to perform this operation so as to reproduce every detail of the model, but the

as to reproduce every detail of the model, but the object of this and all other processes of photosculp-ture is to produce, not a finished satus or bust, but a skitch as next parameter a possible The new Cardin process possesses the dwallage of requiring only one photographic camera. Fig 3 illus-trates the neched of making the photographs required for a portrail but. The sitter is possed, facing the ra, before a triple mirror, by means of which the hack and sides of the head are photographed by refe

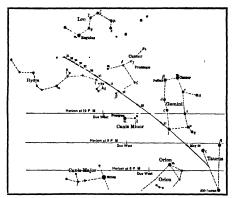
tion As the sitter's face and the three virtual images formed by the mirrors are unequally dis-tant from the lens, the four images formed by the latter are not in sharp focus in the same plane For this reason the ground glass focusing screen is made in four sections, and the plate holder is contrived to hold four plates, side by side, but in slightly different The same cause prod differences in the scales of the four photographs, but in making the enlarged copies which are eming, these differences are easily ved with the aid of the plum mets which are suspended above and at each side of the sitter a bead, and which appear in each photograph and indicate

The modeling apparatus is shown in Fig 1 A vertical post rises from the center of the square iron platform 8 Two photographs, a front view T and are supported in a vertical position by frames which slide in guides bordering two ad jacent sides of the table. These sides are furnished with jointed

supports which carry long rods.

A and B The rods can slide
lengthwise in their supports and
can be inclined and moved vertically and horizontally
by means of the joints of the supports. The rods are used horisontally if the bust is to have the same scale as the photographs, and are inclined for en largements and reductions. The movement of the tograph frames in the guides is limited by fixed paccograph remes in the guides in imitted by fixed stops, so that the frames can be removed and replaced exactly in their former positions The rods and their supports are adjusted to bring

the inner end of the rod A into contact with a con-spicuous point, the tip of the nose, for example, in spicaous point, the tip of the nose, for example, in the full face hehotograph T and the finner end of B into contact with the corresponding point of the profile E. The frames containing the photographs are then removed and the rods A and B are pushed inward in their supports until their inner ends most The point of meeting determines the position of the top of the nose of the bust. The post at the center of the table is covered with clay or other plastic material, which is built out until this point is established in tangible is built out until this point is established in tangible form. The rods are then drawn back, the photographs replaced and a second point of the face is established by a repetition of the process. In this way numerous points distributed over every part of the bunt are stard, each part of adiacent sides of the table, and the corresponding nair of photographs, being employed, as required. The result is an almost complete abretch, obtained from a sitting of a few seconds. All of these operations can be performed by a skilled workman. The hand of the sculptor is called into requisition only to give a few finishing touches in another brief sitting, and to impress as individual artistic actor upon the work.



TRACT OF WALLEY'S COWET AND WEIGHBORING STARS WAY GOAT 1010

(lower down, between these and Regulus). With these

tiower down, between these and Regulus). With these as guides, the other stars can readily be picked out, and the comet identified

From present indications it is probable that at first (on the 50th and 51st) the comet will be as bright at these bright stars and viable at a glance. Toward

In observing it telesconically, the even est power, giving the largest field of view, will be most mile

seton University Observators

The Electicity of the Earth,

Some interesting experiments have recently been carried out by Prof Milne, F.R.S., the well-known authority on seismology, to demonstrate the visasticity of the earth especially under the infraeshe of the tidea. Some years ago he showed that valleys during the day are of greater width than at night, there being any are or greater which than at highly takes seeing an expansion or opening out under the action of the sun and a contraction or closing up in the hours of darkness. He also showed by means of seismographic records secured at his observatory at Shide, that the

# Wireless Telegraph Apparatus for Contestants of the Glidden Tour

BY RENÉ HOMER

In the district selected for the annual Glidden tour this year, ordinary telegraph communication will be very difficult, and at times impossible. In 1909, ai-though the thur passed through a comparatively wellintegrates our peace unrough a comparatively well-settled country, the whereach our of contestants were often unknown for hours. One car, for instance, failed to report at the night control, and no one knew what had happened until the next morning On another comming a passenger was injured in an



mboe serial set up in our.

accident, and nothing was known of the matter until it was reported by a belated tourist at the night check ing in Many minor difficulties were responsible for considerable delay that could have been prevented if the cars had been in communication with the last

The Chalmers-Detroit Company propose to keep in The Chalmers-Detroit Company propose to keep in touch with the contestants by means of wireless teleg raphy Complete plans have not been worked out yet, but it seems probable that some such acheme as the use of three field wireless stations will be favored, two of being in touch with the wire system, while the third station is being established at some advantageous point ahead of the contestants. The exact details of the plan

station is being estationate it some avartageous per sheed of the contestants. The senset details of the plan will be furnished after a trial car has had a chance to go over the worst portions of the proposed route In the early part of March successful wireless tol-graph tests were made for the Chalmer-Detroit Com-pany between one of its ears in Central Park, New York, and the old Terminal Building at Park Aven-The distance varied from one and one-half to three miles in the trial from a moving car, while the experiments with the portable field stations showed that this type of apparatus at least would be able to carry on certain communication up to fifty miles, as the field station was able to keep in com-inunication without any trouble with the Metropolitan

and Manhattan Life towers and another wireless station at Newark, N J Later, communication was maintained between a car on the New Jersey highways near Trenton to the "sparkiess" wireless at tion on the Land Title Building at Philadelphia, nearly

hirty miles away
The receiving station for running automobiles comprised a 7 foot serial in connection, through a loose coupling, with a variable and a fixed condenser, a decoupling, with a variable and a fixed condenser, a de-tector of the audion type, tolephone receivers, and a high and low voltage battery. The sending set com-prised two storage cells, a 10-thon peark coil, two Loyden Jars, and a 3½-inch "radiotone discharger" stellar to those used at the Metropolitan and Men-hatian Life mailtons. This apparatus, which worked successfully up to three miles, the farthest distance successfully up to three miles, the farthest distance tried, would-probably operate for several miles far ther. The ground was gooured by drawing between the rear wheels a bleyfer tubing frame supported on four small wheels mounted on roller bearings the middle space being occupied by three Sinch steel wheels with the bearings arranged no as to allow the steel of the bearings arranged no as to allow the steel of the bearings arranged on a to allow the steel of the bearings arranged on a to allow the steel of the bearings are steel of the steel wheels all times with her read on the meadamized roads of the park this system of grounding worked fairly well, although on the sandy roads of Now Jursey, of the park can system or grounding worked tarry well, although on the sandy roads of New Jursey, where the subsequent tests were made, a great deal of difficulty was experienced in properly maintaining the ground The spraying of water over the contact wheels by means of a small rubber tube leading up into the car partially overcame this trouble, and no doubt subsequent experiments will provide a suitable way of securing a satisfactory ground contact, al-though it is true that probably for some time to come the speed of moving cars must be considerably limited for successful wireless work. The cars in the tests ran only about ten miles an hour

Field stations which can be put up in five minutes can be operated more successfully and the same apparatus used in the automobile by stopping the mathine and securing proper ground has a range of about ten miles. The sending circuit of the field stations used in the longer distance tests was the same as that of the moving stations with the exception that three storage cells instead of two were used, and another 10-inch spark coil was connected in parallel with the first coil, so as to be operated from the same key

This gave a range of about fifty miles

The field sending station was provided with a 100foot serial secured at one end to a sureader attached to a 4x-foot bamboo telescope mast and leading down diagonally to the top of a 12-foot mast about 90 feet away and thence back to the wireless apparatus about midway between the two poles.

Two of the photographs show the first successful test, in which a 35-foot aerial and a 6-inch spark coll actuated by one storage cell were used. With this apparatus, from Central Park, communication could be held with the laboratory at 42nd Street, about one

and one-half to two miles away.

In the more recent tests additional condensers storage cells, and audion receiving accessories were used The closer view shows a radion detector in use (top of the box to left) while a perikon detector is shown unconnected on the table in front of the other appara tus The box upon which the operator is sitting contains the interrupter, spark coil, and discharger, which are inclosed on account of their delicate nature and because they have not yet been protected by patent in the newer station all this apparatus is carried in the automobile, and there is no necessity for setting up the apparatus on the ground although the seap box does indeed make an admirable table for a wireless station
In the coming tour it is proposed to send two scout



Automobile wireless equipm

rs ahead of the regular contestants, each one of which will carry the complete field set of even greater range than that which every car can carry Points where the telegraphic facilities are poor or impossible where the telegraphic facilities are poor or impossible will be picked out and the two cars will arrange to be at stations at these points just sheed of the pilot car one station being eqtipped for business while the other is taking care of the telegraphic business of the tour in this way one of the two field stations will be in operation all the time, while the other is being set up at the next point along the route

Disastrous as the floods in France have proved for the railways, a worse disaster occurred one day last winter in America. Three days previously a warm wind arose in the State of Nevada, so suddenly as to melt all the snow. The result was such a torrent as to entirely wash away 100 miles of the San Pedro, Los Angeles and Salt Lake line south of Caliente The route of this line was known to be rather liable to this, but was chosen as it saved much distance Soon after its construction it was undermined by a storm, which did over \$500 000 damage to it. The engineers Are now engaged in surveying the district in order to find a safer if longer and most costly route. Which ever route be chosen, it will be from six months to year before the line can be built and the cost will it is said, be from ten to fifteen million dollars

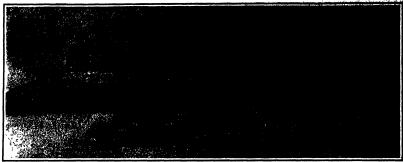




The sectomobile confraent with the abrust and wireless apparatus.

o- sung wireless messages from an automobile.





The practical success achieved with the gasoline-propelled motor sieigns on the Shakiteton and Charleston and C mounted on runbers or skates, a chain and spreecht with apuda with a prized with a prized with the ripped the snow and fee being flitted at the position occupied by the wheels in the ordinary motor car In the new sleigh, however, what may be termed an adaptation of the pedrall or cater pillar ayatem has been resorted to, which imparts a gratter dozree of efficiency to the vehicle, and enables

it to surmount obstacles and to travel over rough los and snow with case. In view of the conditions prevailing and the work it is intended to fulfill in the south polar regions, the segime is of a special type developed the prevailing and the prevailing and the prevailing and the prevailing and covering the whole because the prevailing the prevailin

area such as an ice field steering is not demanded When it is required to deviate to the right or left. rope attached to the front of the frame can perform this function. Turning sharp corners, under these circumstances, is admittedly exceedingly difficult, but when working in its designed sphere this drawback will not be extreme, as sharp turning can be genor-will not be extreme, as sharp turning can be genorally avoided.

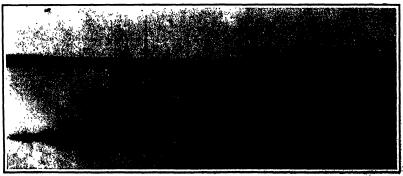
any avoided. The sleigh has a substantial wooden frame, and un-derneath is fitted a large undershield extending from end to end so as to present a perfectly amount sur-face to the snow When the sleigh is under way a curious fact is observable. The chain, where it (Concluded on page 407.)





Pedrall meter sled which Capt. Scott will use on his ferthcoming antarctic expedition.

Capt. Scott's traction aled undergoing its tests in Norway.



A liwedish motor traction alod with a maximum speed of 36 miles an hour.

# THE FLIGHT FROM LONDON TO MANCHESTER

## THE AVIATORS' OWN ACCOUNTS

Both White and Paulhan have furnished the London flatty Mail with accounts of their remarkable flights. White rose at 1.30 A. M. Twonty-four minutes later he was in the air. It was so dark that poople were

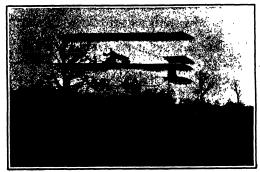
waspe rose as Lao. A "reculty-root runnisses must be was in the sir I twas so dark that people were grouing about with instarts.

As I stood by the side of my serropians," White states, where was atter backness facing me, faintly states, where was atter backness facing me, faintly states, there was not record to Rosels station, and the states of the state of the stat and I rose once more.

"Great difficulty presented itself in knowing in the darkness whether I was ascending or not. I had done no night flying before, but I soon became accustomed to watching closely the movements of my elevating plane, which was silhouetted before me against the

ered on for a spell with nothing at all to guide me After leaving the lights of Roade bohind, the gleam from an occasional signal box far below helped me, however, and so I picked my way through the night to Blisworth

"Here I felt surer of my ground and here away to



Grahame White leaving Rugby.

flow off till I was over the train. I saw the lights of Rugby, flow over the town, and forged shead "Daylight began to come now, and from here on to the point of my descent in a field near Polesworth my etruevie was not with the darkness but with the wind

Paulian, too, seems to have been troubled by the winds, for he bears out White's account. He writes

"I had to fight the wind all the way from London.

Not a moment s rest came to me in my battle against

"Glance at my altitude chart and you will see that I made rises and dips of as much as 720 feet always with the object of flying in the steadlest level of air f could find
"After the start I was going north for a long time

before I sighted the special train which was accom-panying me, but there was no mistaking it when it caught me up, with three loud toots of the whistle and a big white signal cloth flowing from the window

"It looked like a handkerchief from such a height but it told me all. I could see that things were going well. The wind whistled and so did I

well The wind whistled and so did I
"I flew until it was quite dark Ali I could make
out beneath me was the smoke of the train once in
a while and the occasional flicker of lights from a

"I came down rapidly from 300 meters to 100, so that I could be more certain of my direction. Then came the most exciting moment of my flight. Darkness had fallen and before me I saw the lights of Lichfield I decided to alight in some convenient meadow before reaching the town and to de this I sank down to 180 feet. I was immediately above what looked like a largo factory with a chimney I am now told it was a brewery And so, to slight safely in a field with no damage done, I made a fishbook turn, and my machinu

was now pointing toward London
"Suddenly my motor storned Every drop of petrol had been exhausted and the machine swooped down ward almost like a stone dropping

"What should I do? Beneath me was the browner



White's scroplane after landing.

the left for Weedon Faint lights shown here and it was the fierce gusts which eventually brought not there Some, no doubt, were cottage wiedows and others, I think, were the beed lights of motor-cars. I Paulhan, too, seems to have been troubled by the of over Weedon, my eyes becoming more accus-

tomed to the darkness.

"On I flew The welrdness of the sensation can scarcely be described I was alone in the darkness.

scarcely be described I was alone in the darkness with the rear of my engine in my sers. As I glanced back small bright flashes of light, the discharge of the exhaust gaser from the motor, fashed out in the nickness of the many one, for a spall. I scarced soft the right, I when me, for a spall I scarced soft the right, I when a light tomy jet caught my eye, and I worked my way back to the rullway line again
"At a little inm by the readside near the village of Crick a friend had promised to draw up his motor car, schaing its headilights upon the wall to set as a gride chain in the conditions.

Creax a rreson may remnase to creaw up memore car, shising its headlights upon the wall to act as a guide for me I was keenly on the lookest for this unmis-takable light sign, and, sure enough, I saw it quite distinctly below me soon after I left Welton station

penna.

I deviated a little from my course and headed for this patch, of light. I saw the motor car moving as I. approached, with its headlights throwing a great path of light down the readway. It set off at a break-neck pace, its driver evidently meaning to guide me

neck pass, its driver orificatly assuming to guide me on any vay.

"Leaving the miliway lise on my left, I followed the light of the motor cay, and for a mile or no I hierarch almost dipartly above it, attening it to sate the my pilot. But while I was doing an I chanced to giftene over to the left again. Coming down the yath-ity line I replayed a poofs trait. It was making he will like I replayed a poofs trait. It was making he

"This, I thought, will be a splendid guide, and so I swung away from the lights of the moter car and



Rectarging the gaseline tank of White's machine. THE PLICAT PROM LANDON TO MANGRESTER.

and a certain smash, behind me was a narrow field, which was almost like a spider's web with its mesh of telegraph wires

"I had an imperceptible fraction of a second in which to make up my mind, and I decided to risk the telegraph wires. As I sank I made a sharp twist

the telegraph wires As I sank I made a sharp twat right back on the line of my rourse, and was lucky enough to lift myself over the wires 'I went to hed at 1 o'clock deiding to start again as soon as I was light or o'clock allittle earlier I slept like a top for five hours

"It was still dark when I reached the narrow readow beside the Trent Valley station in which my machine was lying. My mechanics had worked well during the night. The machine was charged with petrol and she was all ready for the start.

Happily, favored with the headwind I was then I rose without difficulty, turned, and headed straight

Tiere was the end of my concern about the issue of the race. Barring accidents, I was bound now to react Manchester in safety and in good time, and there was no reason to anticipate accident, for I had surn the worst of the difficulties—that of a rise from a narrow field only 120 yards long above dim lanterns which were my only indications as to the whereabouts of the bedge.
"As soon as I got up I made a circle followed the

railway, and then set off for Crewe, fighting all the way against gusts of wind So certain did I feel of the road that I did not trouble to take my man on the

age hourly velocity, 127, maximu per hour Weather. st, total movement, 9,169 miles; averm velocity, 44 miles per hour Weather. Clear days, 7, partly cloudy, 18; cloudy, 10, on which 0 01 or more of precipitation occurred, 11 Mean relative humidity, 68 1 Dense fog, 4th and 18th. Thunderstorms, 6th and 25th. Fro Light, 14th, heavy, 18th

## COMPLETION OF THE PERMSTLVANIA RATIDOAD TURNELS AND TERMINAL STATION.

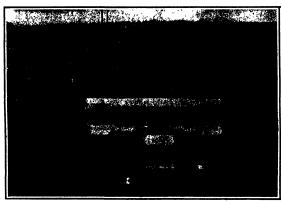
As late as the year 1901 the Pennsylvania Railro was employing ferries to land its passengers in New was employing ferries to land its passengers in New York city just as it did in 1871, when it first leased the United Railroads of New Jersey Ten pears ago the system was hauling freight to Esstern cities over practically the same heavy grades as were to be en-countered in 1876 To-day the company is completing a monumental improvement in and around New York city which will enable passengers to travel from east ern, western and Long Island points direct into Manhattan Island, arriving at a railroad station which, for convenience and for the beauty and dignity of its architectural appearance, probably outranks any simi-

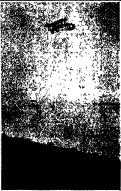
lar building in existence.

During the past ten years the company has spent an enormous sum of money in straightening out its line to the East, and in cutting down grades, and in a few months' time freight trains which are already traveling over the new lines, on which they encour ter no grades greater than twelve feet to the mile, will be run direct to large terminal wharves on the New Jersey shore of upper New York Bay, and fer

the original street surface, extend from Tenta Aramab to Servantt Avenue, From Tenth to Nitet Aramab to Servantt Avenue, From Tenth to Nitet Aramab to Servant Avenue, From Tenth to Nitet Avenue and Tenth and Tenth Avenue the bage street and Tenth and Thirty-blard Street. The excertation covers therefore over five of the largest city blocks, and travolved the removal of over \$200,000 colleb parks of material. Proceeding seaterly from the terminal year, the tracks, four in number, are carried below Thirty-second and Thirty-third Streets to the East Niver, which we have the past in the past of the past

cent.
The new terminal station located between Thirty-first and Thirty third Streets, and Seventh and Bighth Avenues, is a truly magnificent structure, built of grantice on classical lines The terminal work was carteen or classical lines. its on classical lines The terminal work was ear-ried out under Mr. George Oibbe as olhel engineer, to whom we are indebted for contrained curing the prep-aration of the present article The main entrance to the station, on Seventh Avenue, leads through an ar-cade forty-free feet wide by two bundred and trensty-five feet leng, to the main waiting room, which, with its width of 105 feet, ranks as the largest in the world-just what these dimensions means is shown by our front page engraving, which portrays the central por-tion of the New York City Hall with its tower, standing on the floor of the waiting room, with the top of its flag pole falling to reach the roof by fully ten feet.





The crowd on Wormwood Norubbs awaiting White's start.

Paulhan in full flight.

second stage of the journey This was a mistake, for after leaving Crowe I thought the first station marked my landing place, but I could discover none of the marks I expected to find there, and I had to circle back my landing place, but a boots and i had to circle back toward London before I picked up the whitewashed marks on sleepers which directed me onward "I made yet another mistake in my route, and had to curve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet another circle backward, but at last I ocurve in yet of the property of the proper

saw the new station at Burnage, which was my objec-tive, and I saw the white marks in the field where I was to land

was to tand
"I landed and I knew I had won. All the way from
London it had been a fight between me and a pursiling
wind, and I had beaten the wind"

## Official Meteorological Summary, New York, H. Y., April, 1910.

Atmospheric pressure Highest, 30 28, lowest, 29 57, mean, 29 93 Temperature Highest, 79, date, 30th, mean, 29 93 Temporature Highest, 79, date, 30th, lowest 34, date 8th, mean of warmest day, 64, date, 5th, coolest day, 41, date, 8th; mean of maximum for the month 31, mean of minimum, 48, absolute mean, 540, normal 481, daily excess compared with the mean of 40 years, 59 Warmest mean temperature of April, 54 in 1871 and 1910, coldest mean 41, in 1874 Absolute maximum and minimum of April for 1874 Absolute maximum and minimum of April for do years, 20 and 20 Average daily access siteo January 1st 41 Precipitation 453, greatest in 24 hours, 223, dates, 36th and 36th, average for April for 40 years 130 Excess above normal 121 Accumulated excess siteo January 1st, 04 Greatest precipitation, 702 1874, least, 180, in 1881 Wind Provailing di-

## THE PLICAT PROM LONDON TO MANCHESTER.

ried across to Bay Ridge, Long Island. The company is about to construct a four-track arch bridge across the East River near Hell Gate, and when this is completed trains will be run through Long Island from Bay Ridge to Port Morris, where connections will be made with the New York, New Hawen and Hartford Rallroad Passeners from the Routh Southwest and Railroad Passengers from the South, Southwest, and est, over the Pennsylvania Railroad system, by ing the North River and East River tunnels and the Heli Gate bridge, will be enabled to travel without change of cars between New England and the West by way of New York city These stupendous works, which will have cost in the aggregate, including the revision of the western line, over \$150,000,000, were posived mainly during the administration of the late

A. J Cassatt, former president of the company
Commencing at the western end of the New York vanpany variance and of the New York tunnel system, we do at Harrison, New Yorks, and a marker state, where passesses are trained and transfer station, where passesses are trained to the state of the on a high ambankment serous the Hackensach mead-ows to Bergas Hill, where they enter the western portal of the twin tunnels. They descond an a grade of 13 per cent to a level about 100 feet below mean high water of the Hodson River, which level is reached about conclude of the distance from the Jer-ery above. The line then rises on grades of 05 and 185 per cent until the station yard is received at Touth Avenue. The yard and the station, which have been excursted to an average depth of fifty feet below

Opening out from this room are two smaller waiting rooms, each 58 by 169 feet, which are provided with the usual retiring rooms. On the same level also is the main baggage room, 450 feet in length The bag-ages is brought in, and carried away, through a spe-cial subway, the trunks, etc., being delivered to the call subway, the trunks, etc., being fedirered to the track below by motor trucks and seivations. "Passing through the main waiting room, the traveler will find himself on a vaca concourse 101 feet wide, which ex-tends the full width of the station and parallel with the large waiting room. From the concourse, statu-ied down to the train platforms on the track level. The concourse, which is 450 with the street surface. The concourse, which is 450 with the street surface of the state of the state of the street surface. In concourse, which is 450 with the street of the gians. Between the concourse and the trucks is ac-concourse, sixty feet in width, which will be used for outsping passengers only

concourse, sixty feet in width, which will be used for outgoing passengers early. The Thirty-third Street side of the station will be devoted to the Long Island Railroad service. It will be provided with its own surrances and suits, and the traffic will be handled independently of the western

In the design of the exterior of the static architects, McKim, Mend & White, endeavor give to the building the character of a monus d, teare to the samular are constraint or a magazine as estimate to the commercial metropolis of the constr, which would at the same time conform to the traditional super of a great railway terminas. Also the station, was designed to give as free a circulation as station, was designed to give as free a circulation as the constraint of the

bear least at maskes an altensated not intrivative next alpha. Allowing for its much greater scale, the main sparent as comparison to the main sparent as comparison and a comparison and comp

tered 27,000 tons of steel and 48,000 tons of brick
The statistics of dimensions and quantities of ma
terial are of such interest that we present the following from among those supplied by the railway our

| ,                                    |       |             |
|--------------------------------------|-------|-------------|
| Area (10th Avenue to normal tunns    | a i   |             |
| - section east of 7th Avenue)        |       | actes.      |
| fourth of trackage                   |       | miles       |
| Number of standing tracks at station | 21    |             |
| Sumber of passenger platforms        | 11    |             |
| Potal excavation required            |       | cubic yard  |
| Length of retaining walls            | 7,800 | feet        |
| Number of lineal feet of streets an  |       |             |
| avenues carried on bridging          |       | or an arei  |
|                                      |       | ut 8 acres. |
|                                      |       |             |

required for retaining walls, our, street bridging and substructures mber of columns supporting station 160,000 cubie vards diding
ritast weight on one column
shor of buildings removed on ter
dinal area, about
or capacity of service power plant principal plant plant length of tunnel (2-track), Jersey to Long Island 5,000 be

After passing under the East River the four tubes such Sunnyside Yard, the terminus of the Long Isl-hd tunnel extension, which covers some 158 acres

5.8 miles

of land It contains 73 miles of track, and has a caof land It contains 73 miles of track, and has a ca-pacity of 1,850 cars. From the Sunnyaide yard there are tracks leading to the New York connecting rail-road, which will form a junction with the New Haven Railroad at Fort Morris.

An important feature of the New York to An important reature of the New York tunnel e tension is its relation to the Long Island Railros which is subsidiary to the Pennsylvania system. It estimated that forty minutes will be saved between It is Long Island points and New York city by the or tion of trains through the East River tunne Pennsylvania station at Thirty-third Street,

ction of the tubes beneath the Hudson The construction of the tubes beneath the Hudson and the East rivers has been so fully described in previous issues that it will be sufficient here merely to recapitulate the principal features of this work. The tubes under the Hudson River were driven by a The tubes under the Hudson River were driven by a special shield designed by Charles M Jacobs, who is also well known as the chief engineer of the four Hudson River tubes which were simultaneously being driven for the Hudson Company's system of rapid transit tunnels. Contract for the North River tuntransit tunnels. Contract for the North River tun-nels was let to the O'Rourke Engineering and Con-struction Company The shields were thrust forward by twenty four rams capable of exerting a pressure of 3,400 tons. At first, the silt and other material were removed through the doors in the front of the shield, latterly, however, the shields were pushed bodily through the material, and only about o a-third of it was removed through the tunnel, being admitted of it was removed through the tunnel, being admitted through the doors in its lower face. The cast-rice linits of the through the doors in its lower face its circle in the control of the neaver lining, wen concreted up and equipped, is 31,469 pounds per lineal foot. The weight of the slit displaced, per linear foot of tunnel, is 41,548 pounds The weight of the tunnel with the maximum train load is 41,869 pounds per linear foot Thanks to the very able and officient engineering staff, the excellence of the contractors' equipment, and

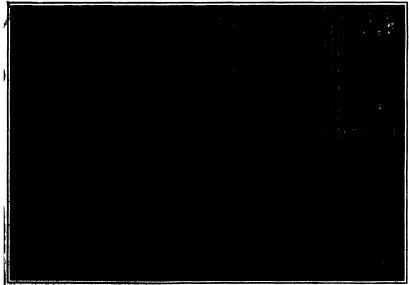
the harmony with which all concerned entered into the task of driving these tunnels, the work was carried through practically without a hitch, and considerably faster than the most sanguine expectations

The driving of the tunnels beneath the East River, rae driving of the tunnels beneath the East River, which was in obarge of Alfred Noble, Past President of the American Society of Civil Engineer, was done to the American Society of Civil Engineer, was done material through which the these pased, much trouble americal through which the these pased, much trouble americal through which the through so successful completion. In addition to the many millions the Pennsylvania Railroad is appending on the foor tunnels under the

Railroad is spending on the four tunnels under the East River, and the station and terminal in Manhat-tan, all of which will greatly benefit Long Island, the Long Island Railroad is increasing its own facilities in all directions, so as to adequately care for the larger traffic which will result from the completion of the tunnels. The contemplated works will necessi-tate an expenditure on the Long Island system of more than thirty million dollars The new service vill include a six track line from the mouth of the tunels to Woodside 2½ miles, one mile of 8-track road, Woodside to Winfield, two miles of 6-track road, Winfield to Glendale cut-off, and 4½ miles of 4-track winded to General cut-on, and 4% miles of 4-frack road thence to Janaica. Trains will run from Thirty-third Street, Manhattan, to Janaica in 18 minutes, to Garden City in 34 minutes, to Mineola in 34 minutes; to Far Rockaway in 33 minutes, to Flushing in 16 minutes, and to Great Nock in 28 minutes.

minutes, and to Great Nock in 28 minutes.

We will close by giving some of the startling statistics of population which in the judgment of the Pennsylvania Railroad Company fully warranted the enormous outlay involved in the great works which the company has undertaken The population in the company has undertaken. The population in-cluded within a circle of nineteen miles drawn from the City Hall in Manhatian as a center, was in 1890 3,328,988, in 1900 it had increased to 4,612 153 and in 1905 it had grown to 5 404,633 It is estimated that 1905 th had grown to 5 404,538 It is estimated that by 1913 the population of this territory will be about 5,000,000 people, and in 1920, 5,000,000 The rail-mode that have their termind on the western bank of the Hudson River carried nearly 18,000,000 people in 1886 In 1895 they carried over 1200,000, in 1895 more than 94,000,000, and in 1906 they carried about 14,000,000 people The significance of these figures was fully considered by the Pennsylvania Rail-mode, and the significance of the figures was fully considered by the Pennsylvania Rail-mode, and the significance of the significance of the pennsylvania Rail-mode, and the significance of the significan



pers design the commontee (650 feet by \$60 feet) from which they dec and he statements to the serious and descriptor electrores below Interior view showing the conceurse and the etation pintherms.

wated temperatures depict specificity of the setting buff, at rectar and made and addresses, at control of the setting temperatures and tembers.



BIRD'S-EYE VIEW OF THE SUPERS STEEL AND CRANTE TRANSMALETION OF THE PENSTLYAMA BALLROAD ON MANHATTAN ISLAND latforms, and fine it extent the tunnshifteen New Jersey and Links Idand. The respective term 378 foat on the streets.



## HOW TO BUILD A HOUSEBOAT FOR \$800.

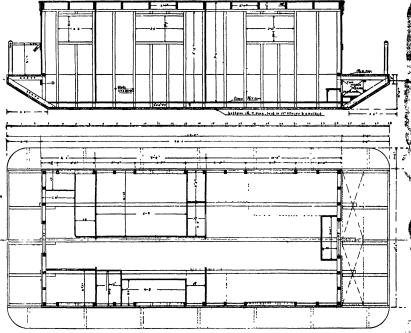
The proposition of spending a summer affect is one which appeals to many persons fond of the water, but her coal of a yatch large enough to accommodate confortably a family for a protracted period is problic to the majority, therefore people swelter ashore in but and unremfortable incide, and snatch such approprient from the water as chance and circumstances

during the summer meanon under equality constructed conditions. The cost of the host would vary, according to whether it was built by sansateurs and how shabornistly it was constructed and fitted up A moderate price shipbuilder should build this host complete with totled and water tasks for twe hundred dollars. As the host is very simple in construction annateurs should be able to build it for about three hundred dollars. At a summer to be a summer to the shabes of the same land and the same that the same to be supported to lead to be suffered to the same to the same land to the same to the same to the same land to the same to the same to the same land to the same to the same to the same land to the same to the same to the same land to the same to the same to the same land to the same to the same to the same land to the same to the same to the same same to the same to the same to the same same to the same to the same to the same same to the same to the same to the same same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same to the same to the same to the same same to the same same to the same

For those interested in building such a boat themselves the following hints on construction may prove

The first step in construction is to prepare the pround and belief the sides and bottom of the buil. The ground about the prepared by driving posts and using stringers and blocks so pinced that the built may rest during construction on an absolutely lavel plane. By doing this a level and plumb like can be used to get the house and its compartments built plumb and true After the building foundation is prepared, start by so that they touck on the minds and anti-open along, it is notated. This is to allow the existing to be driven in and to prevent it being peahed clear through to the inside. In perticag the hull together the large parameter in Doc Halls about, of c 4th inches less. The corner lot. A should be fastened to the sides with a perturbation of the board of the control of

It might be well first to call attention to the two water tanks that are shown in the drawing. If these are to be put in it is well to do it now, otherwise some



SECTIONAL PLAY AND SIDE VIEWS SHOWING CONSTRUCTIONAL DETAILS OF THE MODERNOAT.

A solution of the problem of living cheeply and comfortably fields it found in the houseboat Back a life offers many charms and advantages it is generally cooler on the water, and the aris afresher and better being free from dust and land amelia. Bailting a slavay "on Lop," and the outertainment of friends is againspatied with more charm and privacy that is a reflect assume hotel if the locality becomes tireform the house-beat can be towed to another harbor for the contract of the contract of the contract of the first the contract of the contract of the contract of the first the contract of the contract of the contract of the contract of the first the contract of the contract

for a rew solure and there is no packing of tranks or the articles of the property of the prop

PS SIDE VILWES RECOVERED CONSTRUCTIONAL, DEPARTAGE OF T griting out the sides. These are of 1½ inch yellow piting, laid three strakes to a side. As the depth of the bull is 30 inches the sum of the three plants should be a side of the construction of the bull is 30 inches to the three plants of the construction of the bull of the wood secowed to them. When thus secured fusion on the lower isself edges a yellow plus corner log 2 x 4 inches as shown in the cross section plant at A The colyect of this is to siften the dogs and afford extra nailing surface for the bottom plants New set up the sides in their proper plance on the building foundation and be very careful to see that they are perfectly plants and level, otherwise the whole strepture will be croded. Nail three or four strips across the bottom to held it in plants and then yell in the sed places of continuous strength of the plants of the plants of the continuous plants of the plants of the set of the plants are of 1½ yellow plant, as well as the bettom case, are of 1½ yellow plant, as well as the bettom case, are of 1½ yellow plants, as well as the bettom case, are of 1½ yellow plants, as well as the bettom case, are of 1½ yellow plants, as well as the bettom case,

of the deck teams and deck cannot be haid, and it is more trouble to put them in later. They should be of 1-16-ind galvanised iron and sixed with filling plakes to come shash with the outside of the deck. The stupply pipes can be run under the cabin flooring before it is

come muss replace can be run under the cable flooring reper down. Insulate to just to are the still beams.

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Insulate the water boarding of the horse. The beams

are of \$72 \$-linch ayrons. They should be red, just

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signaly. But in the headers and sills for the windows of the study immediately under them.

Proceed to finish the decks. Run 15 x 3-inch yellow no stringers across the end stude 4% inches below here the top of the deck will come. Use

where the top of the desk will come. Use 3x 3-land yillow pine deck beams, seven to a deck, including sides, and securely mail to the stringer and end board of the hall. A desk of 14/-inch white pine may then be laid in about 10-inch widths or less, and after being well painted covered with No 10 canvas. As the run boards on orther side of the hall will serve convenwhiter old of the hull will improve a second of the hull will represent the property of the pr

so that they may serve as a backing for

the partitions.

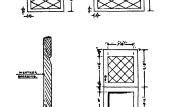
It is now in order to board up the sides. Use % x 6-inch rabbeted boards of the type shown in the section Start from the bottom and lay out the widths, as shown in the plan, so that they will come right for the finishing bands. Nail each board to every stud with two nails, and counterwink and putty the band. The sides are now ready for the finishing bands and window trim' Commencing at the corners put on the writcal trim of % inch witte pine 8 inches to the control of the control of the control between the control of the control of the which should be 8 inches deep and finally the second band at calls top and the win-which should be 8 inches deep and finally the second band at calls top and the win-comment of the control of the control of the window trim, both inches wide Al the fore-going should be of %-in-h white pine The set back so that a shoulder is created by the stude and sills to form a rabbot for the window The cross section plan will stud with two nails, and countersink ar

the stude and stills to form a rabbet for the window The cross section plan will show this The windows are hissed from the top and swung outward, as indicated. Proceed to finish up the cabin root by planking it over with ½, firch within planking it of the control of the con

and get rid of seams which are liable to leak. Draw the

canvas over the edge of the house, and after securely fustaining with copper tacks cover them up with a haif round molding, as shown in the plan. The doors and windows should be 1½ inches thick, and these

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Deers are Dutch type breezine in the middle. CROSS SECTION OF THE BOAT AND DETAILS OF THE DOORS AND WINDOWS.

plans will be sufficient to enable any one to get them out The doors are of the Dutch type that is, they open in two sections They are more handy and convenient when thus made,

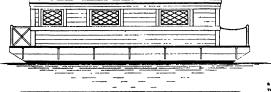
An ornamental railing fore and aft, as shown, affords safety and convenience. The after side is fitted with a rope, which can be unbooked to allow boarding the This completes the hull, and we can now turn our attention to the interior

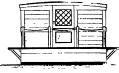
turn our attention to the interior.

The first step is to lay the cabin flooring after painting the inside of the bottom. The floor may be of %-inch yellow pine, laid either in 8-inch widths or in nar rower widths, with tongue and groove. The former width is perhaps preferable in this case Begin at one ond and plant athwartship on the stringers and corner to the property of the stringers and corner to the stringers are the stringers and the stringers and the stringers and the stringers and the stringers are the stringers are the stringers and the stringers are the stringers logs. Sweep out all shavings and saw-dust as you proceed After the floor is laid and smoothed up, the partitions and

laid and smoothed up, the partitions and cable fittings are ready to go to provide sleeping accommodation for a mixed company of four Enterting the house partition of the is turned into a sleeping room for the neu at night. The decorately has a remov-able tread, and is used as a locker On the right a 8½ a 7 foot couch is installed, the right a 8½ a 7 foot couch is installed, the partition of the partition of the partition of the Upon the oppositive side, near the door is Upon the opposite side, near the door is a folding borth, shown standing on end This is built simply like a hollow containing an ordinary spring and mat tress. It is lowered down for use and afterward up-ended and hold by a couple afterward up-ended and hold by a couple of hooks In the opposite correr is a sideboard with glass rack above and drawn one beneath to hold table lines A folding table and two or three easy chairs complete the furnitum in this compartment. Of course chairs and outh abouid be bought, but it would be more satirated to to make the deals sideboard and table. and this would not be very difficult if it was done simply of eak, in the mission style, and statued. The next compartment is for the laddle liters a double bed is abown which may be taken from the house and installed or built in like a regular bunk with drawers underneath or the open for the reception of trunks. There are two lockers at the foot, one still the control of the co mirror and folding wash basin on the left and the galley fittings on the right. An alcohol stove is indicated along with a

alcohol stove is indicated along with a porcelain sink and ice-hox under the dresser Blores may be carried under the forward deck. The partition for the cabin divisions and lockers should be of 3; inch cypress put up in 3 inch strips, tongue and groove, with





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a V or headed edge. White paint may be used but a a v or readed edge white paint may be used but a very nice effect is had by staining the partitions and stud beams dark green and filling in between with green buriap tacked in place and finlahed around the corners with a neat little molding. The roof and house beams should be either white or a very light olive gray beams should be either white or a very light olive gray greon Varnish the floor and use rugs or mats of course the cabin sides may be celled over but that adds somewhat to the expense and admits of a less artitute effect A very good looking finish for the exartisate elect. A very good noting inner for the ex-terior is as follows. After calking the bottom planks with oakum putly the seams and then give the bottom three ceats of red antifouling pain! Carry this up the sides for 10 inches. Paint the rest of the hull black sides for 10 inches Fraint to weather boarding looks well Make all the bands, window trims and sash and deck railings white The decks and cabin top should have four coats of a bull color All other wood should have

The boat is moored by securing chains on eith of the bull and leading them to a common chain about 15 feet ahead of the boat. Use three times as much chain as there is depth of water and a 300-pound much room anchor, and there need be no fear of going ashere

## RECENTLY PATENTED INVENTIONS.

COAC NOT PARTN HANGES.—8, OLGIMAR, New York N V This hanger is adopted to support in a smooth well formed manner the cost and either the pents or skirt of a suit of clother. It has a supporting but and a clamp-ing har cooperating with the ber, the latter lening adjustably sevured at one cod and re-movably secured at its other cod.

Of Interest to Paramers,
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Fram Tide invention relates to a type of
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to provide a guard that is effective in service,
to provide a guard that is effective in service,
by live stock, without injury thereto.

Of General Interest.

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individual OIRPLAY FIX CURB - W. E. TAYLOR, Bt. Louis, Mo. This fixture is more especially designed for advantageously displaying wall papers and the life and arranged to accompodate a number of wall papers in proper posi-

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## Heating and Lighting.

Heating and Lighting.

VAPOR HURNER — B. B. RAIMOND, Los Angles, Cal. The invention relates to burners adapted for the combustion of coal oil and the distillates for the generation of host, and has for its object to provide details of rounsirus then for a burner that render it capable of vapor ining and consuming heavy coal oil, without smoking or depositing of residuum in the burner

smooting or depositing of resistant in the burner TRILLAMP BOCKET - V T Batter Kee York, N 1. The present invention has in view to construct and apply a cover in a main ner such that the socket ring may be revolved on the seekst shell to earry the case from over the posts and exposes the bleiding serves thus avoiding the necessity of entirely remove ing the cover from the base for this purpose. ing the cover from the base for this purpose POITABLE ACCTPLENDED AS GNERIA TOH — O A LAVRLEAS, Watermanel, Mich investion shouldes an outer water task, as him earlier and the cover cover water task, as him earlier and the cover cover and provided with an onlared peaked per central arem adjustably connected to the cover and provided with an onlared peaked per from the water task pervolates him the extended period of the cover having a coulest aerona for attaining the gas as it is better the generator, with the secon pointing outwards.

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COMETS Their Origin, Nature, and History By Henry W Elson New York Sturgis & Walton Company, 1910 Illustrated, 54 pp Price, 50

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RE INTERNATION OF RADIUM Being
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part of the chain in contact with the ground constitutes as unrace over which the vehicle itself can move. The driver has his position on a box behind the engine, which seat forms a receptacle for tools, spare parts and other accessories. That the vehicle has great climbing power has been conclusively proved, for it will ascend steep banks of earth and ride over serious obstacles castion in speed

Although this sleigh can carry a party and full equipment, its actual func-tion is to act as a tractor for the haulage of ordinary sledges, the trailing ve bicles carrying the loads. Upon comple tion by the builders, the tractor was taken to Norway by Capt, Scott, and sub-mitted to some exacting trials on snow covered Lake Fefor and the tumbled country in its vicinity, where the condi country in its vicinity, where the condi-tions were somewhat analogous to those prevailing around the south pole. Heav-ity laden trailing sledges were hitched on to the dractor and numerous journeys were made among the Norwegian ice fields. The vehicle proved itself fully capable of withstanding rough usage, and Capt. Scott expressed his complete satis-faction with the results achieved

Very different from this sled in design very suzerent from this sied in design is one which has lately been put to a series of severs running tests over all kinds of ice and snow in the district of the Silian lake, Sweden The accompanying photograph of the motor sieigh was taken in the Easter days of this year, after the above-mentioned tests had

been carried out.

The design differs from that of other automobile sleighs in the driving mechanism. The sleigh is propelled by two driving wheels, each fitted with a number of steel paddles between which an elastic frame is fixed. This simple construction thus combines the advantages of a paddle wheel and the Canadian snow shoe, having the propelling capacity of the former on fixed ice and snow sur-faces, and the supporting and friction capacities of the latter on loose snow The flexibility of the frame tends further to prevent the snow from clogging by ex-pelling it from the paddles. The driving wheels run in the tracks made by the wheels run in the tracks made by the sleigh runners, and thus tend to make a good contact surface for the paddle wheels. In case the snow is not com pressed enough by the runners, the paddle wheels sink by their own weight into the snow, and compress it sufficiently by means of the frame The paddles engage compact snow by cutting with the compact snow by curring through the crust as knives, and work on account of their breadth, against such a large wedge of the frozen snow surface, that an effective counter pres e is obtained which would otherwise sure is obtained which would otherwise be impossible if the driving wheels were, for instance, provided with splices instead of paddles. The sleigh is in this in-stance driven by a chorse-power double-cylinder air-cooled gaseline motor. The motor steigh illustrated is designed to serve only as a traction engine, to which any kind of sleigh can easily be attached or detached within a few minutes.

or unsecuted writin a new mindless.
It is no course easy to make the motor sleigh as self-contained as an ordinary automobile, and the electrically-driven foreignment of this sleigh were successfully built in this way.

The motor sleigh is governed by means of a very ingenious and reliable steering devices over for remote hand operation The power required for steering is truns

ngibed from the operating hand-wheel through facible tred tubes to the motor furth the text a speed of 4 miles as a hour cyst a simoth ice purious was attained. When traveling over the snow and feeduraged rands, which were in a very lad



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CO., her, Publishers of Scien 361 Breadway, New York condition on account of the prevailing thaw, a speed of 10 miles an hour was attained, the total weight drawn being over one ton. During a running test of several consecutive hours, the average speed was 19 miles an hour

The inventor is a Swedish engin

An Industrial Laboratory for the Im-provement of the Incandescent Lamp.

Although the establishment of a rearch laboratory by a large manufac ing organization is not a novelty, the in-ception by such an organization of a lab-oratory which has for its object the development of science rather than the improvement of some industrial commod ity is probably without precedent. For that reason, Mr E. P Hyde calls atten tion in a recent number of Science to the new physical laboratory of the National Electric Lamp Association, even though it is still only in a formative state. The it is still only in a formative state. The object of this laboratory is scientific, the specific purpose being the development of those branches of science with which the art of lighting is closely associated The fundamental idea which has prevailed in the organization of the work is the proper co-ordination of physics and physiology. ration of the the physiologist and perhaps the psychol

ogist.
The organization of the laboratory is proceeding with this idea as the foun-tion. The development contemplates sharp distinctions among the different divisions of the work. The prob be investigated, however, group ne investigated, however, group themselves roughly into three classes. therefore require, in order to insure proper attention to each, a threefold divi-sion in the organization. The three groups of problems to be investigated may be classified as (1) those that have may be classified as (1) those that have to do with the production of luminous energy, (2) those that have to do with the utilization of luminous energy, and (3) those that have to do with the effects of luminous and attendant radiation.

Under the first class will come the in "existing the laws of redistion, and

vestigation of the laws of radiation, and of the radiating properties of matter. The problems in this class are purely physical and the corresponding division will be intrusted to a competent physicist.

Under the third class will come the in vestigation of the effects of light and the attendant radiations on the eye, on the skin and on microscopic organisms. The problems in this class are physiological, and the corresponding division is under the charge of a trained experimenta physiologist

of problems (the first and the third) which are distinctly different, there is another (the second) which forms the onnecting link. Touching on one side connecting link. Touching on one side the physical production of light, and on the other the physiological effects of light, this intermediate division of the work will embrace most of the scientific problems peculiar to illuminating engi pronouns peculiar to intumnating engineering. Investigations of the aborbing, reflecting and diffusing properties of matter, the measurement of light, i e, photometry, and the study of the complex phenomena of color and color sensation. properly come within the scope of this department of the work.

Section Cities Washing,
Mesers, Allice and Gimel recently presected a paper to the Academic des Sciences concerning the good results ob-tained in the production of cleder by wash ing the apples with an oridizing solution in the apples with an oridizing solution of the populations of the north and west of Frame, its manufactures should concern hygienize as well as technicians. In many cases the quality of the product is much cases the quality of the product is much inferior to what it should be were the process well carried out. The washing of process well carried out. Ine washing on the applies indispensable to free them from the impurities which they carry, but we must also take account of the defective quality of the water which is available in many cases. The authors' previous re(Concinded on page 466)



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um is an elementary metal i it melts at 3600 degrees h ; alloyed with iron in the pro-portion of one to two, it melts before the fusing temperature of iron or steel, and as Ferro-van-adium may be thus added to the foundry ladle, the open hearth furnace or the crucible, to iron or steel

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(Concluded from page 477)—
searches showed them that oxidising agents could be used to advantage, and they experimented with hydroxyl, oxonised water, and hypochlorites of soda and of lime is solution in the water which is used for the wanting Used in the proportion of 40 to 50 centiferammes per little. of water (04 to 06 per 1,000), which is more than enough to destroy pathogenic germs of the human species, they find that hypothlorite of lime has a good influence the activity of the pectase, which is the congulating diastase of the pectic matters of the juice of apples. Where the fruits congulating disatase of the pectic matters of the jutic of apples. Where the fruits carry much impurity they should first be washed in ordinary water before immersing them in the ordinaring solution. The tests carried out first in the isborstory in 1900 were pursued in the cider-making districts during the seasons or 19074 and 19084, and they led to the following conns First, the addition of hypoclusions First, the addition of appennication of the of lime in the above proportions according to the state of purity of the fruit, assure the purifying of the doubtful waters as to bacteria for the present purpose. The juice of the fruit thus treated is found to clarify rapidly. The congulation of the to clarify rapidly The congulation of the pectlo matter is always well carried out and we have formed an abundant brown surface layer This assures the stability surface layer This assures the stability of the cider with time in this respect. The dissusses, especially the maloxydase, are eliminated by precipitation, so that we avoid the principal cause of darkening of the cider it is also found that the hypochlorite has a favorable selective action on the Saccharomyces mail and a destructive action on the anserobic germs, and it thus solves practically and simply the problem of a pure fermentation. By ad-ding to this treatment the method of repeated under-drawings, we can obtain cider which will keep much longer, and this is of interest for producing bottled this is of interest for producing bottom cider There is no harmful matter intro-duced by the present process. Compara-tive analysis of cider made from treated and from untrated apples shows a marked advantage in favor of the former.

Military Kites.

Kites, as well as dirigibles, captive balloons, and acroplanes, may be made serviceable in military scouting, and their simplicity makes them especially valuable. Furthermore, they can be employed with any velocity of wind between ployed with any velocity of wind netween is and 66 feet per second, whereas the use of a captive balloon becomes difficult if the velocity of the wind exceeds 18 feet per second Experiments recently made at Boulogne by Capt. Saconney show that it is quite practicable to carry show that it is quite practicable to carry two persons by means of a large kite. The kites used in his experiments were of the Cody type with four sustaining planes and with triangular stabilising wings in this method of construction wings in this method of construction each rectangular cell is strengthened by diagonal rods of bamboo to which the stabilizing wings are attached. The ap-paratus consisted of a series of kites conpartitis constitute of a sorted of street of sup-porting the cable, and of a second series of kites attached to a very light carriage, which moved along the cable, and from

which moved along the cable, and from which the car or basket was suspended Kites can nearly always be used at sea and on the coast. They are simpler and less expensive in every way than balloons and they are also strong and easily repaired. These qualities should make them valuable for many purposes in military and especially in naval opera-

A wireless telegraphy station near Beriin claims to have established a record d overland and sea transmis sion of wireless messages. The station recently succeeded in maintaining wire-less communication with a Woermann less communication with a Woermann liner during the entire voyage from Hamburg to the Cameroon The greatest distance signaled was 8,600 kilometers (over 4,000 miles) Although messages had to pass over the Alps the Algerian tableland, and the Adamana Range, communication was, it is stated, effected with astoniching cases.



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THE May Number of Assersa House and Cardeas a deroted to be mail.

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entitic American No. 19, Vol. XCVIII. Qua Phosphoreaceace and Meteor Trailus. An article in which the investigations of C. C. Trowbridge of Columbia University are described, showing that the after give produced from a vacuum culturerity are described, and the state of Consta. An article in which the famous context of the larvier are unumarised and described and modern connectory the culture are unumarised and described and modern connector the larvier are unumarised and described and modern connector the larvier are unumarised and described and modern connectory theories discussed.

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counce as accuracy with a comments on the part appearances that the American Supplement No. 1905 The Next Appearation (1916) of the Cornet. An unportant article by H C Wilson, with a map giving the pof the counct relatively to the orbits of the planets from September 15, 1 July 11, 1910.

July 11, 1910.

entific American Supplement No 1632 Halley's Comet. An article by Bentet, P. R.A., which tells how Halley came to discover the comet. The supplement No 1779. Edmand Halley. A blography E Oore, M. R. I. A. of the man who dispelled constary superstitions and fine the supplement No 1779. Edmand Halley. A blography E Oore, M. R. I. A. of the man who dispelled constary superstitions and fine the supplement No. 1779. Edmand Halley. A blography and the supplementary superstitions and fine the supplementary supplementary

An explanation of the vagaries of a conset's tash, by Arthus Estantive Months, and the parties of a conset's tash, by Arthus Estantive Months, and the parties of a conset's tash, by Arthus Estantive Months and the constant and

Hallev count. untile American Bupplement No. 1778. Heliey's Commet. An article in the suggested observations proposed by the Astronomical and Physical Sc of America are given, so far as photography and spectroscopic observation concerned.

own account or an investigations on orbita, mittie American Supplement No. 1765. Halley's Cease Barth A table prepared by the distinguished Greasw Cowell, giving the ecliptic co-ordinates of Halley's o places at intervals of four days through an arc extending other of the latur rectain of its orbit. The figures apply

one of these papers will be mailed on receipt of so cents. The entire set will be sent for \$1.70. Order from your newsdealer or from MUNN & COMPANY, Inc., 361 Broadway, New York City



# PENNSYLVANIA RAILROAD



## Bulletin

## THE BUSINESS MAN'S TRAINS

The man of affairs when he travels wants all the conveniences of his club. He will either carry his business on veniences of his club. He will either carry his business on the train with him, or make his trip a recreation. In either case the Limited trains of the Pennsylvania Railroad meet his requirements. If he wishes to talk business en route, a drawing-room or state-room supplies the private office. If he wishes to finish up some left-over correspondence, there is a stenographer at his elbow to do his bidding without charge. If he wishes to keep in touch with the market, he has the stock reports, which are telegraphed to the train. Many business and professional men take advantage of these faithers. facilities.

If, on the other hand, he wishes to forget business and take a mental rest, he can do it in a luxurious manner, and take a mental rest, he can not it in a introduction manner was unrounded by tasteful appointments and all the things that his club supplies for satisfying the inner man. There are books to browse at, periodicals to skim over, and beyond the wide plate windows an ever-changing picture of nature in all manner of environment. This is restful and at the same

all manner of environment. This is restful and at the same time engaging. The quintette of Limiteds, led by the "Pennsylvania Special" (the 18-hour train between New York and Chicago), "The 24-Hour St. Louis" (fast evening train to the Southwest), the famous old "Pennsylvania Lamited" (the Pioneer of the Limited's to Chicago), the "Chicago Limited" (evening train to Chicago), and the "St. Louis Lamited" (the afternoon train to the Southwest), are all expressly equipped for the use of the business man and the traveler for pleasure

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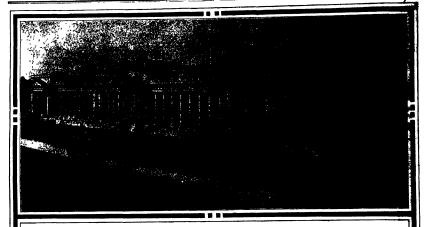
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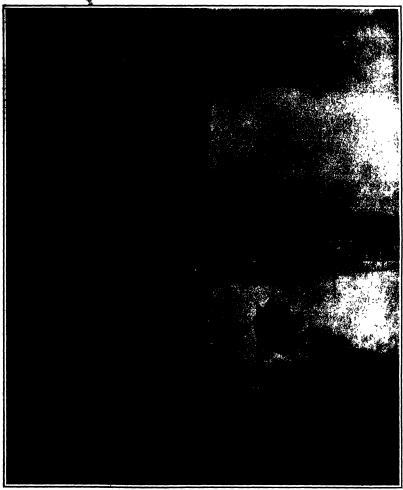
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# A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

NEW YORK, MAY 21, 1910 \* [10 (K)TR 4 (OF)



Oil was street at 4,000 feet daysh

The stream reshed forth with such violence that it like will be toy of it is derick and now over 200 feet above the ground foliate in a which related closes the street of \$2,000 feet and now over 200 feet above an in the foreground of the pieton.



## SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO . Inc . Editors and Proprietors

## Published Weekly at No. 361 Broadway New York

CHARLES AND MENA Products
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NEW YORK SATURDAY MAY 21st 1910

Plu bellior is always a led to proving for a numerical dimerizated articles on athlects of that, by interest. If the photographs are sharp, the articles short and the facts authority me contributions will receive special sections.

### HEW SKYSCRAPERS FOR OLD

NDER modern industrial conditions things are done in a big way and often with a strong dash of the spectacular. But the city dweller, albeit he is daily confronted unusual and the unexpected must confess to some measure of surprise on learning that a modern akyseraper 300 feet in height, and but a dozen years old is to be torn down to make way for a new structure which is to be several stories higher, and—more up to date. If you please fo the conservative Euro-pean, the ruthless demolition of a building that must have cost over a million dollars and is still entitled to be called new, will appear, no doubt as another instance of our national vice of extravagance. But it is not so. The Gillender building is being razed in dance with a certain industrial doctrine, which has been found to give most excellent economical rehas been found to give most excilent economical re-sults namely the dotrine of the scrap heap, ac-cording to which we blive and have proven in a thousand ways that so soon as the marn to improve-ment or divelopment renders it certain that there is more profit in scrapping an esticing machine plant, or building, and replacing it by another more efficient or diversity respects. It is a matter of sound business. or of greater capacity it is a matter of sound business to send that machine to the junk heap wrecking gang' loose upon that building turn the

The policy is purely utilitarian—brutally so if you like—a mere question of dollars and cents, but it is a good business policy nevertheless, and, in reality en one of the most powerful factors in bringing about the present phenomenal industrial development of the United States

Your old world engineer or architect with perhaps tronger flavor of sentimentalism, hesitates a faithful servant so remora lessly out of the way a patinii servant so renors wessy out of the way lie will point a the pride to his forly served documentive with its million mile record of service, and he will add wing to wing and another story or two to a building, if this be possible rather than rare to the foundations and build from the ground up It is a case of each to his choice, though there are not want ing many indications that British engineers are begin ning to realize the value of the scrap heap, and apply the principles which it implies in the development of their industrial enterprises

The Gillender building which stands at the north west corner of Nassau and Wall streets, in this city west corper of Vassau and Wall streets, in this city be a sixten-story sie-eltranic office-building which was completed in 1886. The construction was first class, the foundation being put down by the pneu matic process and the siev! frum thoroughly braced to resist wind and racking strains from street to feet and the picturesque three-story tower above brings the total height to about 300 feet. The exterior of the building is faced successively with gran limestone and terra cotta Examination shown the structure to be in as good condition to-day as when it was put up and engineers and architects will be greatly interested as the steel frame is uncovwill be greatly introcuted as the acted traine is unto-erred to observe how much, if any exidation of the inclosed steel work has taken place. In all probability judging from the condition of the steel work of other composite buildings which have been demolished. south for instance on the Pobst building removed a such for instance as the Point Parish the Control of the New York Times at racture no reading will have occurred that is worthy of mention The runwal of the Olliender building while it will not probably bring to light any nea facts regarding the bactor of inclosed sievel columns, will attunct establish the conviction (about ewrything be found intact) that if the steel work be

thoroughly painted at the mill, at the shops, and before it is inclosed in the building, it is absolutely proof

as long as the inclosing walls and roof endure Outside of rusting, there is no other known agency that tends to shorten the life of the steel frame of th modern akyacraper Exploded long ago was the theory of the fatigue of metal Simple statical stresses or even dynamical stresses of frequent repestreams or even dynamical streams of frequent repo-tition do not necessarily shorten the life of stee structures it is only when these repeated streams approach the clastic limit that the strength of the noted by invertible-and in the modern skysersner no such conditions exist Certain imaginative magazine writers to the contrary notwithstanding the visitor to New York five hundred or a thousand years hence will find the skyscrapers of to-day in perfect condition, provided, of course, that the doctrine of the scrap heap above referred to has not called for their

### OUR WAVY AS A WATIOWAL INSURANCE.

T the recent launch of the "Florida," as the great ship was starting down the ways of the crowd was heard to remark "! a shameful waste of public moneys it seems when we think that this \$10,000 000 ship may never be employed in the work for which she was built, and that if she ever gets into a fight, she may be sent to the bottom within a few minutes of the open ing of an action. The remark was characteristic of much that is being said and written on the subject of the wastefulness of modern armaments Taken by itself it would seem to be convincing, but if we look first! It would seem to be convincing, but if we look at the question breadty, and with that just sense of proportion which is necessary to a correct estimate of the value and meaning of things we shall see that such a talk is the justest sophistry. The centifices of a battleship must be judged in relation to what it stands for and the work which it is intended to do in the last analysis the "Brofied" is one element in an conomical system of national insurance, designed to protect both the lives and the property of the ninety millions of inhabitants of the United States

The true test of the question of the extraof naval expenditures is to determine the ratio that of mail expenditures is to determine the ratio that they bar to the money value of the property which they protect. The following estimates of expenditures, which have been furnished from Washington show that the first cost of the ships of the navy, as they float to day is roughly \$400,000 000, while the current annual expense of their maintenance is about \$44,000, The cost of maintenance last year, including pay of officers and entisted men of the navy and marin corps pilot dues provisions, clothing, ordnauce equipment, medical and machinery stores including coul, water and other incidentals amounted to nearly \$32,000,000. The cost of repairs to the bulls machin ery and equipage of the vessels amounted to more than \$6,000,000 making the combined expense of pre-serving peace on on shores nearly \$44,000,000

The amount involved covers the expenses of all the various types of our ships of war which include bat tieships armored cruisers, cruisers scouts, the tor pedo flotilla monitors, gunboats, supply ships, hospi tal ships colliers, converted yachts, tugs and receiv

ing ships
As an (xample of the heavy expense of maintaining a big ship of war we may take the battleship Connecticut which was the flagship of the Atlantic feet during the last year. The pay of the officers and flect during the hast year. The pay of the officers and enlisted men of the navy and marine corps attached to the vessel and the expenses incidental thereto amounted to nearly \$800,000. This did not include the cost of the necessary repairs.

The home floot or the yessels attached to the Atlan the adde of the country, last year consisted of sixteen first-class battleships which were divided as fol-lows six of the 'Connecticut' class of 18,000 tons. five of the Georgia class of 14 500 tons, the and 'Mississippi" (lass of 13 000 tons each, the 'Missouri' and 'Ohio" of 12,500 tons each, and the "Wisconsin" of 11 500 ions. The average cost of keeping a vessel of the "Georgia" class in commission and on active service, which did not include repairs was mearly \$680,000, while that of the 'Idaho" and "Mis-sissippi' class was nearly \$530,000 each. The average cost of the 'Missouri" "Ohio" and "W While these figures will vary for the same ships in different years, the cost of maintenance will not change much from year to year for the same class. The total cost of keeping these sixteen battleships of the Atlantic fleet in active service last year amounted to more than \$10,500,000. It costs just about as much to keep an armored cruiser in active service as it does a first-class battleship, as is evidenced by the fact that the ten armored crubers which were in commission last year cost the United States \$7,000,000. Of these cruis ers in commission, six were of the "West Viginia" 13 880 ton class and the other four of the "Moulana" 14.500-ton class

With the increase in size of the battleshtps, then is a corresponding outlay for pay of the personner stores, maintenance, and repairs. The latest builds ships to be placed in commission, the "Michigan" and "South Carolina," each of 16,000 tons displace will require crows of more than 50 officers and will require crews of more than 50 officers and more than 500 officers and more than 500 officers and more than 500 officers and control of the state of the stat there is no denying that these exper

considered by themselves, are enormous, but when they are measured up against the vast nat. and our navy is sink into positive insignificanceto be the least costly, as it certainly is the effective, institution in that scheme of national rernment which is designed to protect the liver property and to further the happiness of the p

If the above seems to be a strong statemen. capable of easy proof The latest estimate on wealth of the United States available in the But wealth of the United Busies are more of Statistics is that of 1904, made by the Census reau which put the total for that year at \$107,104, may be regarded as the compor-ce against damage and loss of that 107 fill-id as such, it represents a premium of city-shundredtha of one per cent if we inclu-ent on the capital cost (400 million). 917, or \$1,310 per capita The 44 millions which navy cost last year may be regarded as the cost insurance against damage and loss of that 107 i four one-hundredths of one per cent the interest on the (apital cost (400 millions) of the existing fleet, the premium is only six one-hundred of one per cent while the cost of the "Florids" militons) which loomed so large in the eye of the captions critic at her launching dwindles to one one hundredth of one per cent of the wealth of the com-

## THE UTILIZATION OF SOLAR HEAT

F the heat of the suns rays were entirely converted into mechanical energy, it would furnish ore than two horse-power for each square yard of surface exposed to the sun, but in practice is is difficult to utilize solar heat. Attempts were made in France by Wouchot and Teiller in 1871 and in Sweden by Briesson in 1883. Mouchot and Teille d a conical mirror to concentrate the rays upon a boiler containing water or other voiatile liquid, but the mirror was costly and it gave only one horse power for 12 square yards of reflecting surface. Tellier, in sed the sun's rays to be absorbed directly by a lamellar boiler, containing a thin layer of water or more volatile liquid, such as ammonia or carbon disulphide. The same method has been recently employed by Shuman and Wiltsee in America. Shum employs the steam generated to drive a low pressu The boiler is constructed upon the principle of a greenhouse, i e on the property which glass possesses of transmitting the sun a rays but stopping turn of thermal radiation from the The boiler is a large vat coated with pitch and con-taining a layer of water three inches deep. An appa-ratus of this sort was operated in Philadelphia in

e also employs a lamellar boiler covered with glass, but the water heated in this boiler is us raporize the more volatile liquid ammonia or sulphur dicaide the vapor of which performs a closed cycle In California an apparatus of this kind with a boiler of 120 square yards of heating surface, furnished a mean power of 15 horse-power Wilface estimates the cost of the apparatus at about \$150 per square yard cost of the apparatus at about \$1.50 per square yard and calculates that it should aboons, at the \$41b parallel of latitude, about 4.000 calories per square yard per day. With these data about 1.50 square yards would farmish one horse-power and would cost \$80. For a large plant of 0.00 horse-power bowerer the total first cost per horse-power would be doubled. The cost of perstulent is about 3.50 cent per horse-power out of perstulent in about 3.50 cent per horse-power.

In experiments made at the agricultural station in experiments made at the agricultural station of Lausanne Switzerland, for the purpose of determining the effect of potash fertilizors upon natural meadowa, two neighboring fields having almost identical soils of glacial mari, showed a marked difference in effect and glacial mart, showed a marked difference in effect and very currousty, the soil of the field that had yielded the larger crop was found, after harvest, to contain more points them that of the other held. This remark-able result has been traced to the influence of drain-able result has been traced to the influence of drain-se. The better drainage of the field which replica-tion of the second to the second to a coluble until more, and caused the roots to extend to a greater water to the eight and utilize a larger volume of settle. This sci-ample shows that the fertility of a soil cannot always, be determined by electrical second. oth and utilise a larger volume to a soil caunot always ple shows that the fertility of a soil caunot always determined by chemical analysis alone.

### ENGINEERING.

TO MARKET TO THE STATE OF THE S

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Respictived computes continues to widen the range of its application. The Western railroads are preparing to build this semmer long stretches of reinforced concrets show sheds. These will not only be stronger than the present timber structures, but they will be entirely safe from the meance of fire

The independent goalline-driven rullroad motor cat, which we have frequently illustrated in this portrait, is growing in favor. A new car, 70 feet in length, is growing in favor. A new car, 70 feet in length, Rachester and Pittsburg Rallroad. This is the seventy-borth car of the types to be turned out from the product of the contract of the seventy-borth car of the types to be turned out from the shops, and it is the sixth car to be built for service cast of the Missistopia River.

The over-necessing weight of Western passenger trains is being must by a steady growth in the rise and power of the bocumentree. The Chicago, Milwauter As E Paul have recently travel out of their shops we types of siz-coupled simple locomotives, with epiloder 32 inches by 32 inches, one of which has "Shinch drivers and a tractive effort of 33 900 pounds. 4 the other Shinch drivers and a tractive effort of the property of the contract of the property of the contract of the c

560 pounds.
An electrically operated pile driver is described in a
Precent number of the Electrical Review and Western
Electrician The apparatus, which is of English make,
as provided with a revolving frame and swivel leaders. Instead of a mechanical device for gripping the

is provided with a revolving frame and swivel leaders. Instead of a mechanical device for gripping the monkey, an electro-magnet is used, the top of the mon key being planned of gmooth to provide a good contact surface. An electric motor is used for operating it holding crab. The electric for this motor includes the magnet, and the switch for the inter is attached to the crab.

An important paper on oils used for switches and imaniformers was recently read at the Manchester exists of the Institution of Electrical Engineers. It was pointed out that very little attention has been paid to the quality of the oil used in this way, and that any impurity in the oil would reduce its resist that any impurity in the oil would reduce its resistance at different tenues, also that the succellar resistance at different tenues, also that the succellar resistance at different tenues, and the success of the subject was urged with a view to obtaining oils of stand ard resistance values.

and reliatince various.

La a reseast lacture before the Engineers' Club in New York, Mr. Elimer A Sporry, the electrical engineer, demonstrated with a working model the value of spreadown and the spreadown of the spreadown of

Amorica will be represented this year in European racht racing by the large and powerful wommand althouser, "Westward," which has been built by Herres boff for A S. Cochrase of the New York Yacht Cabi The "Westward is the largest American racing schooner yet sont serous the Adantic She is of 197 tons gross, as compared with the "ingenary" of 142 tons, also built by Herreshoft, which a few years ago made a brilliant record in English and German waters she will meet the big Gorman archeoners. Mercur has been been been supported to the conbattic schoolers of less size, but of proved speed and shift?

According to A. A. C. Swinton, the first flight of model aeroplate propelled by steam is to be credited to the Hon Charles A. Parsons of turbine fann, who in 1889 built an aeroplane with two Il-boot wings and a iall, and drove it with a steam engine whose cylinder was 144 inches diameter by 1 inches stroke, Mean being respelled by a boiler 344 inches long, in these long, in which sissum was generated at 50 pounds pressure by a spirit kmp. The whole appart state, including seroplane, engine, and Ivel, weighted 48 pounds, and it few for distances of 160 yards at a height of 30 feet, coming fown only when the steam height of 30 feet, coming fown only when the steam height of 30 feet, coming fown only when the steam

pressive foll
We here hen favored by Mr. George Wortinghouse
With here hen favored by Mr. George Wortinghouse
With the following particulate of his new reduction
gare High-special startes turbies. The roter consistence
will weigh about 1½ posside per horse-power in sizes
of from 3,000 to 1,100 heresoover The number of
histories of all kinds in a turbine of from 7,000 to
1,000 horse-power will be slightly under 1,500. The
optal weight of the turbine with roter will not casped
yporting per horse-power. But he weight of the samelag will be under it peends per horse-power The
diffect of this reduction of weight in feen in the saw
adval collier, No. 3, which will carry 300 toes seen
fact than it side were deriven by reduprisinging congius.
As arriag of an additional 500 tone will be resident as

### ELECTRICITY.

The conditions under which a street lamp should prove its afficiency are very different from those which govern the indoor lamp. This was brought out clearly in a recent address before the New York Section of the illuminating Engineering Society by Dr. Clayron it. Sharp. He pointed out that while in the building it. Sharp. He pointed out that while in the building lamp pass upward and be reflected by the celling in the case of a street lamp this would be a great facil for the vertical rays would be lost. Only those rays that are cast directly downward and horizontally up and down the street can be utilized. For this reason he has devised a reflector consisting of a pair of parabolic nitrores arranged to throw the rays in the direct bound of the deviation of the street can be used to be advantage. Thus, in place of having the street (lighted in spois, as is now the case, a more continuous illumination is provided.

The block signal systems of steam realizeds have witherto been operated with direct current from sicapo batteries. This has always been an expense on into the fincenselence and difficulty of maintaining the storage batteries. In revent times trolley roads have been using an aiternating current signal system which has been found to work very restlentor lifty, and the amountement has just been much that the Pennsylvania Railroad is about to install an after heading current block signals system on the lines tween tolicon, Osho, and the Grand Haspids and Italy an Railway This is probably the first instance of the use of alternating currents for steam railroad signaling purposes and if found satisfactory should do much toward extending the use of block signals on the directurement system is lumpared with.

In an article appearing in a recent number of the Miceric Railway Journal some very interesting con clusions were arrived at concerning the question of the coast of a street-car ried. The nicks luxer nicred for any, a three-mile ride in a street car is the very cheepest investment a man can make for coverhing this distance. Certainly any other method of trans man who walks to his work, if he is earning if centre part of the control of th

La view of the revent agitation in favor of using exteric headilities on locomotives, the experiments along this line by Prof Besjamin, of Purdue University, are most interesting. Prof Heajamin has claim under to be said against the clearly leading the most does the atrong beam of light bilind engine on locemotives coming from the opposite direction to the said against the clear of producing the signals. In one of his experiments the light of a given signal was extinguished, but when the light of a given signal was extinguished, but when the light of a given signal was extinguished, but when the light of a which appeared to the engine of the control of the c

Considerable attention has been directed of late to the inferious offect of vertain rays of electric lamps upon the subject was recently presented by Dr Stockhausen before the illuminating Engineering Society of London, and he pointed out that an excess fraction that there is the been appeared that the red and intra-red rays on account of their heat value, are very injurious. Hitherie it has been appeared that the red and intra-red rays on account of their heat value, are very injurious to the retina, but Dr Stockhausen does not believe that under ordinary resultings are very injurious to the retina, but Dr Stockhausen does not believe that under ordinary resultings in smallight, then rays inge the found in large quantity. The best rays for the human eye are the velocution of the pretrum of

### SCIENCE.

A telegram has been received at Harvard College Observatory from Prof. H H Campbell director of the Lick Observatory, tating that 'Frank McClean cables from Hobert, Tasmanis, steady rain, eclipse instable:

A new inflammable celluloid has been patented by Prof A Gautler The chief feature of the process is the employment of an ether silicate instead of pure ether, which is ordinarily used with alcohol as the solvent in the agglutination of nitrocellulose fibers by means of annhor

The University of Paris and the Parteur Institute have been authorised to renduce, jointy a laboratory of radio-activity located in Paris. This new laboratory will be alived in Invasion as excitons, one of their law review of radio-activity action of sections, the control of the Carle white the other will be devoted to medial applications of radio-activity and is placed under the direction of the Manner Institute.

What does 'gold filled mean.' Probably most people who lary gold filled watche fant's that they are mysteriously impregnated with gold. As a matter of fat, that term is main-ending. Gold filling consists in taking two sheets of gold between which is placed as section of solder-consists have mit. It his merel all sands in is heated and presend so that the three juries are welched together with the gold outside.

Dr. B. Barnard of Verkee Observatory informs as that despite the hase and tounds of the early morning of May 7th, 1910 he obtained fair photographs of Halleys come A tail about 40 dg fong anythen on the photographs To the naked eye it was only 17 deg or 18 deg long The head was of the second magnitude. On one picture the tail showed separately in three strands, some five or six degrees from the hold. The comet was a heautiful object on the mountage of May 4th and 4th.

In a recent bulletin based by his observators. Mr brivalus Joseph describes his nextly-discovered Martian smalls. These new canals are two in number and were discovered on September 20th 1990, to the cast of the Svriks Major where no canals had ever previously here are in They were most conspicuous Not a trace of them could be found in the record drawings of August July, June or May when this part of the planet was depicted nor rould any trace of them be found in the records of previous pears of them be found in the records of previous pears might be one that could have been seen before but was not yet the possibility of error seem sectioned by the size of the canals in question. He regards the vidence as trong that the canals are not simply new to us, but new to Mars. Measurement of the If diseases also show seen and some twenty miles wide. The Canyon of the colorade would be a secondary affair in comparison.

Light is of vry gard Importance to algor growing on the soa bottom and in their strungle to obtain light the plants assemble in structures of several storks. The algor of the genus Lemineria adhere to the rocks by means of disks. The wounds made in the plants by the attacks of animals become convert with a protective vereion in which the counties owners which the sea water contains become entangled syncars which the sea water contains become entangled similar manner by a second layer of plants or of small land in the sea water contains become entangled with a sea of the season of the

The mineral waters of Vichy Clermont Ferrand, Mont and Spa contain fluorescent substances in verminute quantities. The quantity of fluorescent matter often increases with the temperature of the water and diminishes as the amount of solid residue increases At Spa the amount of fluorescent matter has diminished by improvement in piping. The largest proportion is found in waters containing tarry con-silinents. These results are of practical interest in connection with the piping of mineral springs all natural waters whether potable or contaminated contain organic substances which are already fluor escent and others which become fluorescent when the water is heated to 266 deg F for half an hour Th ent of fluorescence is promoted by the addi tion of five per cent of ammonia. All such waters ex-hibit increased fluorescence when they are heated but this change is not produced by heating the water of a properly piped mineral spring because this water has already been exposed to a temperature of at least 266 deg F in the earth, and a second leading does not

The Lowell Observatory has issued a builetin en titled Preliminary Notes on Photographic and Spec titled irreliminary Notes on Protographic and spec-trographic Observations of Halley's Connet. The Observations consist principally of direct photographs of the comet and photographs of its spectrum as seen at Flagstaff Halley's count before April 18th had as Pagastat Itality's coinct before Auril 18th had shown to very striking chance, except in the diverg-ence or separation of the interal stransers. Negatives obtained on April 26th and 27th olsow marked chance in the form of the titl. On the 25th fit tall, at a short distance from the hand divided but parametrical row estimates from the hand divided but parametrical row estimates from photographs made on the follow limitation of the photographs made on the follow the monthing the fall was again outle necessity. side fram has On photographs made on the follow 10 morroug by tail was again quite narrow and straight On the 27th it was again branched. The most runstable changes noticed at Flagstaff in the come ta tail were observed on photographs made on April 10th and May 1st On April 30th the tail had completely changed in form The more or less bilasteral symmetry had entirely disappeared. The plates of May lat show for a distance of about 70 deg a tall well diffied with a gentle curvature, but beyond this point faint and diffuse. The outer parts of the tail on the hast two plates have the appearance of having been acted upon and shattered by some rather sudden and acted upon and shattered by some rainer sudgest and disturbing dishintegrating force. The comet's mearest approach to Venus occurred about this time. The question naturally arises, could the planet have been the disturbing influence? Comparisons of the disap-pearance of the comets tail for some days before and

pearanc of the comets that for some days sectors and after this event may fell us something. The great square of Pegasus acted as a splendid finder both for the comet of 1910 A and for Halley's comet. This mutual association of the two comets. comet. This mutual association of the two comets with Pegasus affords a good example of one of the chief difficulties experienced by those astronomers who have endeavored to trace Halley's comet amid the mass of brief and very general records of comets in actual objection. ancient chronicles

It is unfortunate that the chance of capturing a sample of the tail of Halley's comet was not soized The passage of the earth through a comet's tail is so The passage of the earth introduce a course which are an occurrence that no opportunity should be missed. In the April number of the Bulletin de la Société Astronomique de France, C. E. Guilliaume suggested the liquefaction of a large quantity of air which could afterward be treated by fractional distiliation, and possibly some cometary matter recog pixed. He pointed out that very minute quantities of the rare gases, such as krypton and argun, are thus secured from immense volumes of air and that it is now possible to ilquefy 1000 cubic meters of air per bour It is just possible that by this means a chemi-cal study of the comet might become a by product of an industrial operation

An investigation of Enckes comet by Dr Backlund shows that the acceleration of the mean motion of that body between 1895 1901 and 1904 was not con that body between 1886 1901 and 1904 was not con-sistent Dr Backlund suggeste that the resistance which would explain the phenomenon is a mateorial warm in the neighborhood of porthelion, and that the decrease of the acceleration must be attributed rather to the diministration of the density of the resisting ma-dium than to changes in the comet itself. Dr Back-lund also discusses the contact a fluctuation in bright-ium also discusses the contact a fluctuation in brightness, but offers

no explanation The passage of the tail of Hal led Flammario to suggest that if pable material at so great a dis from the tance from the head it might be possible to meas ure the minute ture produced by rushed through the tail at the ac cond

A 1910 has sped away its peculi arities are still the subject of as tronouncial com-ment Thus Dr commen upon a conical mass of material extending from the bins of the come toward the ent from anything seen in previous comets, and having the appearance of a miniature sodiscal light

eas to be expected that the apparition of Halley's comet would not remain without its effect upon the ore ignorant peoples of the world, even though this



PROTOGRAPH OF HALLEY'S COMET TAKEN BY DR. R. E. BARNARD ON MAY 8, 1910

is the twentieth century, and the days of superstition are supposed to have passed Reports from China state that the comet was used as an omen to inflame rioters in disaffected districts. To be sure, the authorities tried to counterart these attempts by exhibit. ing pictures of the comet with an account of its pre-

ious appearances without ill effects, in order to re ure the natives. This Chinese situation finds its sure the natives. This Chinese intention note in counterpart in Europe. The suicide of a Hungarian farmer "on account of Haller's comet," as the new-papers have it, is followed by a report from Odesas that in Southern Russia there is a veritable popular terror which is being exploited by unnecruptions per-sons for the purpose of obtaining money for special prayers, etc.

Observations of Halley's comet made in Harvard Observations of Hallsy's comet made in Harvard Coljege Observatory on the morning of May 6th lead to the following results The brightness of the nucleus of the comet was measured by Prof. Wendell with the 15-inch equatorial, with the resulting magnitude 706 The nucleus was, therefore, distinctly fainter than on April 27th, when its magnitude was 601. Tha tian on April 27th, when its magnitude was wil. The total light of the comet was greater, being estimated by Mr Campbell as magnitude 2.2 Three photographs were obtained by Mr King which showed a well-defined nucleus. A long tall was shown, which was

THE ACCIDENT TO THE "SEPPELIE"

The recent destruction of the "Zeppelin" airship again drives home the inherent defects of the right sgain curves some one innervat vowers as one type of sirably While journeying from Homburg to Cologne, it was necessary to anchor the airmbip in an open field. On April 28th, at 1 P M, after the vessel had received a new charge of gas, it was storn from its anchor by a storm, and drives wavy in a northwesterly direction. The airmbip came down at Webersburg in the contract of the strength of the contract of the the vicinity of Wellburg on the River Lahn, and was totally destroyed Two companies of soldiers were able to hold the vessel against the terrible storm order to prevent a catastrophe, it was necessary to order the soldiers to release the airship, which imme-diately rose to a height of 700 feet, and was driven away in the direction of Weilburg At 20 minutes past one the airship was sighted from Weilburg Sudpast one the airship was sighted from Welburg Sed-douly, probably caused by a downward gust, the seal was forced down into the Lahn valley. In the seal was forced down into the Lahn valley. In the Lahn valley, where the storm ranged violently, the wind biter the vessel broadcide and present it down to the surth. The nose dipped almost into the Lahn, "Zeppelin" was caught in the telegraph whree which was along the railway. The netal frame was twisted Trees were bent and telegraph poles were torn down, and with a frightful notes the wind buried the snor-mons gas bag against the side of a bill and forced it not the trees. Another gust of wind then threw minim paris, yards of balloon cloth, and sicel rods lay in a rangelof mass. lay in a tangled mass

The catastrophe of Wellburg is the fourth sustained The existance of Welburg is the fourth sustained of drightle straines. The first was that of the French during the Section of r seen again

The next great catastrophe destroyed the "Zeppelin The next great catastrophe destroyed the Zeppelin was on his famous 24 hour record trip of the

4th and 5th of August, 1908 On the return journey about ten kilometers from Stuttgart, Count Zeppelin was compelled to alight at Echter dingen to make repairs. Even be fore it was nous! ble to cure the defects in the mo-tor, which had tor, which had caused him to come down, the atrahip was de-stroyed To this the cause has not been discovered The "Zeppelin

a few minutes. The next cats trophe affect the French dirigi-ble "Republique." The desire of the "La Pe-



rteey of L'Uli

THE WARDS OF THE SEPTEMBER AIR SHIP AT WESSERSTERS, .

# THE THORNE-BAKER TELE-PHOTOGRAPHIC APPARATUS

AN INSTRUMENT FOR TRANSMITTING PICTURES WITH AND WITHOUT WIRES.

On the evening of May 11th, Mr T Thorne-Baker delivered a lecture before the New York Electrical Society, in which he explained a new telephotographic apparents, of his invention. The apparatus is to be experimentally tried out in transmitting newsparry gistures between New York and Boston it has been used by the Daily Mirror of London, between Paris and London, and Manncheuter and London since July. 300 With some modification, it can be delapted to

with some modification, it can be adapted to the wireless transmission of picture, and we will be writeless transmission of picture, no selection she will be a proper to the picture of the wireless of the proper to the wireless of the proper to the picture of t

"The leaf foil picture is broken up into thin and thick likes with spaces intervening. The stylus teaches the lead base or the fish give lines, and the time of contact depends upon the width of the line. Hence the width of the lines determines the periods of the line.

whereon is the paratus is used over a telephone lim. The apparatus is used over a telephone lim. The street is B, and a set of the limit is being closed by the two styles, limited by the limited limited by the limited limi

to used of the line date connected with it when the leakage on the line is great and evenly distributed, less reverse current is required from the balancer (a device supplyed to wipe out residuary currents from the line in the way frequently made use of in digits tells against the supply it is increasing the voting arphy) if it increasing the voting against the reverse batteries B, and B, considerably arrestor contrast. The contrast is the contrast of the co

In all tole-photograph apparatus the problem of synchronism is on that has always bothered the inventor. The bost arrangement is that of Kora whose system has been adopted by most revent, define motors, driven through storm and the storm of the system has been adopted by most revent drawn motors, driven through storm of the system has been adopted or revisitions. The speed of each motor is regarded own the system of the storm of the system of the sy

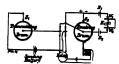


Fig. 1.-Caperal arrangement of the apparetu

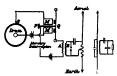


Fig. ?.—Apparatus for transmitting pictures wirelessiv

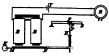
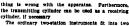


Fig. 8 -Relay employed in the wireless apparatus.

drum, and the drums are always re-started in unison One advantage of Mr Baker's system is to be found in the fact that the putric operation of transmitting and receiving occurs in full view It is not necessary to develop a picture before discovering whether any-



The ordinary two-dation instruments fit into two boxes of moderate size A portable apparatus, however, has been devised by Mr Baker, which he claims can be carried from place to place by an operator, so that pictures can be prepared in the field and telegraphed on Thus plans, positions of troops and of ships can easily be transmitted Perhaps that feature of Mr Bakers researches

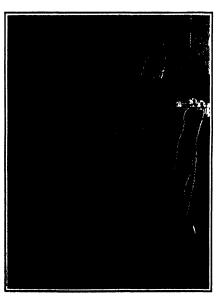
retriaga that feature of Mr Bakers researches which will interest the redeers of this journal most which will interest the redeers of this journal most will be supported by the support of pictures by whereas telegraphy. The principles may thus be explained (Concive a small intendent lamp, coupled with the local side of a relay and battery the relay being activated by means of a roberer When a Morse key, closing the primary of an induction coil, is depressed the ising gloss until the cohere is tapped. The lags can be centrolled by the latest the picture of the picture of

When working with currents of 110 volts, arcing must be prevented. This is done with the aid of a mercury interrupter. The receiving apparatus is aim necury interrupter. The receiving apparatus is aim coheren : 3 most open of peculiar character. Whenever the oscillation passes the antinuate to character. Whenever the oscillation passes the antinuate the coherent pheromes conductive and a relay is actuated which starts a visuality parameter. In order that the hammor may strike only one for each signal the arrangement shown in only one for each signal the arrangement shown in PRE 3 is supplyed. The relay R at tustes the electromagnet E R which attracts the suggest E R. Whith attracts the management of the supplyed of the relation of the supplyed of the relation of the supplyed of the relation of the supplyed of the suppl

the resident hammer H provided with the platinum contact P against the contact pin fixed to the collar F of the coherer A B Thus the local circuit is closed, and a black mark appears on the chemi Diack mark appears on the chemical paper Successive marks can be obtained at intervals of 0.017 second. Up to the present this device has been successfully used only for line drawings The appar atus however might be used for the transmission of sketches and plans bir Baker suggests that military plans could be done in sheller ink on a slip of metallic foll placed upon a portable machine led to a military wireless set, and communications could thus be communication cannot be tapped Even if the enemy were in possession of an exactly similar instru ment of the same dimensions and screw thread the picture received will be quite confused if the rate of running is altered by five or ten per cent, according to pre arranged

aignais

A special form of Finihoven galvanometer is employed by Mr Hs
are for working the relay which
galvanometer has a very intense
magnetic field Institud of the
usual silver wire a silver quarriliber on twelve hundredth of an
lach in thickness is employed
with the relevel worker of the order
with the relevel over combined
with the relevel over the order
ing wireless oscillations recently
invenied by Prof. Flening When
the recitied currents which in or
dinary radio-ledgraphy cause the
telephone to sound, are sent
through the silver quarri fiber the
string its shifted. The shadow of
the string its over a fine silit,
which is thus opened by the occil
uktions. In order to be able to use



MR. THERMS-PARMS AND MIS TRUMPROTOGRAPHIS APPARATUR.

TA 21, 1949

a while r sill Mr Sanger Shepherd has fitted the appa stus with a fine shutter, and in that case the receiv can be modified. The beam of light is then directed through the tunneled poles of the electro-magnet, and a pair of narrow compensated selenium cells is placed helind the slit, a positive lens being interposed. Any dot received shifts the fiber laterally, light fails on the selenium cells, and their reduced resistance allows a battery to actuate a relay which throws the tele photograph receiver into circuit

HOW THE "FLORIDA" WAS LAUFCHED

The launching of the 'Florida,' which took place strictly merording to schedule, at the Brooklyn navy on the morning of May 12th, suchly brilliant function in its technical aspects the launch was particularly successful, and we offer our congratulations to the naval constructors who our our congrammations to the nava constructors was were directly responsible. The ship is now tide up at the navy yard dock, where she will receive her side armor, which is already assembled at the yard, and her tarrots which are also about ready for placing. A most interesting feature of the day was a dinner in criebration of the event, given by the employees

of the yard who built the ship. This event at which some 1 200 were present, included among the speakers Vice President Sherman, Governor Gibbrist of Florida Winthrop of the navy, Adn stant Secretary Leutze, the commandant of the navy yard, Naval Con structor Baxter, and others. (apt Baxter referred to the strong personal interest taken by the whole force of men who worked upon the Florida" in the success
of the ship. To the Editor, who was present as a guest, the genuine enthusiasm raised among the m whenever any refer ence was made to the

ship. the yard, and Its officers weemed to he a strong indorse ment of the policy of ing at all times a battleship under construction at the New York yard

eral inquiries as to just how a battleship is launched, we have prepared the accomshowing a portent the isunching ways how The permanent "ground' ways con-sist of rows of piling driven to a solid bear ing upon which are spiked heavy, square timbers, or "caps," running transversely Upon these are laid series of honvy, longitudinal square timbers in three parallel lines, one immediate beneath the keel

and one on each side of the ship between the keel and the bliges During construction the weight is carried upon the keel blocks and upon hundreds of shoring timbers. When blocks and upon hundreds of shoring timbers. When the ship is ready for issuching and a few minutes before the actual issues the weight of the ship immaferred from the exists lacel blocks and the shoring timbers to the two parallel lines of issuesh-ing ways. Earl permanent way, built up of heavy, square timbers, presents a sliding surface four fact wide extending the shole heapth of the ship and down a considerable distinct firmly down to the cross cause and culture below. The lause blue, ways which raps and piling below. The launthing ways which are also four feet in width, are attached to the bull of the ship, and move with it down into the water Between the under surface of the launching ways the upper surface of the permanent ways is a thick cating of greene oil, and other inbricating substance The launching ways have to be moided to the form the abip for which they form a cracie, and our draw ing shows part of the cradle near the bow, which is known as the forward "poppets." The poppets con-sist of six sets of 14 inch by 14 inch timbers in groups of half a dozon. At their upper ends these groups of and a coson At their upper some these timbers bed against heavy angle iron bracksts, and at their lower ends they rest upon what are known as the "trushing timbers" long lines of parallel tim-bers four feat wide the bottom one of which forms the aliding surface of the launching ways. The abovethe aliding surface of the launching ways. The above-montioned angle trons are riveted to steel straps from a half inch to three-quariers of an inch thick and 42 inches wide which extend down below the keel and up to similar brackets on the other side of the ship

The space between the strans and the bull is filled in

with four inch white pine timbers, which fo bed in which the bow of the vessel rests. To assist in tying the whole cradle together, heavy wire ropes pass beneath the bow and are carried around heavy oak thimbies, placed on the outside of the pop Further support is given by 1% inch tie rods, which are drawn up anugly by note on the outside of the

The crushing timbers are provided through their entire length with a series of oak wedges interposed between them and the launching ways below About half an hour before the launch, hundreds of About hair an hour before the launch, hundreds of workmen range themselves up and down the wars, and by means of heavy sledges drive these wedges home, forcing the launching cradle into closer contact with the ship, and eventually lifting it sufficiently to clear it from the keel blocks, thus transferring the load entirely to the launching wave.

ings us to the consideration of the intering method by which the ship is held in piace, and prevented from starting off down its well-greased "to boggan" until the exact moment when the christening

longian until the exact moment was the curitating in performed and the order is given to let go. The locking and starting gear are as follows.

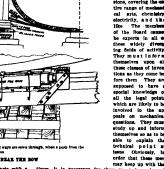
The hardwood launching ways are extended forward and strongly bolied down to the ground or permanent ways. After the wedges have been driven e, and the ship is resting on the inclined and well-greased surfaces it is prevented from moving solely by these boited connections. At the criti-(al moment, at the word of command, carpenters these timbers, and as the cut is made, a point is soon reached where the tensional strength of the remainof appeals understeers support of delay and expense, throws Commissioner the impossible tank of giving to commissioner tea mapositions take to giving to case the amount of personal attention proper to disposal, as demanded by law Lastly, the Edu Examiners-in-Chief, as at present constituted, state of three members, and no provision sists of three members, and no province made under the present law to supply a tem make under the present law to supply a computary vacancy caused by sickness, or other cause, with the result that the absence of one member sometimes re-sults in an unevenly divided Board, and in the conse-

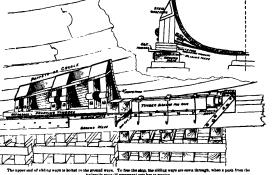
quent necessity for a rehearing. The absence of Cap members causes an entire suspension of business. At The enactment of Mr. Currier's bill into a law would ride an appellate Board, any three memi which would constitute a quorum, the prosecution all applications on appeal would be expedited, and the elimination of one appeal would mean the saving elimination of one appeal would mean the savingible the inventors of one appeal fore, attories; 'fees-she incidental expenses Leathy, one appeal in the Pauglie Office instead of two would give a reater stability for the decisions of the office irribunals, and would with the contract of the office irribunals, and would with intend in the past between the decisions of the Complexity of the

tor, who made a careful study of it and transit for the consideration of Congress. The pate n, as a whole, is in favor of the measure

The value of the measure will be appreciated a sider the manner in which the Patent does its work Each of the forty-two examining AM. The sions deals with a special class of inventions.

> in-Chief, consisti ent. must deal with inventions from all at tire range of mech cal arts, chemistry, electricity, and the like The member of the Board cans be experts in all of these widely diverging fields of activity They must inform themselves upon all these classes of inven-tions as they come before them They are supposed to have a special knowledge of all the legal points which are likely to be involved in the appeals on mechanical questions. They must study up and inform able to explain the technical point at issue Obviously, in order that these men





LAURCHING WAYS AND CRADLE OF "FLORIDA" BEAR THE BOW

ing timber fails to hold the vessel. It parts with a loud report, and almost invariably the ship starts, slowly at first, and then more rapidly, for the water Occasionally a yearel will stick and must be given Occasionally a vessel will stick and must so gives a start. For this purpose, four heavy ramming time here are laid in position abutting against the end of the launching ways, with hydraulto jacks interposed between them, and heavy timber abutments. Should the ship "hang," a brief operation of the jacks is generally the property of the parks in the part of the parks in the parks in the part of the part of the parks in the part of the part of the part of the parks in the part of the part of the part of the parks in the parks in the parks in the part of the parks in the p

Reducing the Rumber of Appeals in the Poissa effici Mr Frank D Currier of New Hampshire introduce on January 21st, 1910, a bill the principal purper of which is to expedite the granting of patents in the Patent Office, and to eliminate one appeal in the office in his last annual report the Commissioner of Patents mended such legislation and advocated a n thich would combine the Commissioner, the l tant Commissioner, the Assistant Commis and the Examiners-in-Chief into a single appellate trii unal, any three of whom shall constitute a subrum, to which all appeals shall lie, whether from the Primary Examiner on from the Examiner in Interferences, and from which appeals would lie to the Court of App of the District of Columbia.

of the District of Columbia.

Thefor the present patent law in or peries came an appeal line from the Privatory Examiner to the Bunch Privatory Examiner or the American Commissioner's, and from his decision to the Court of Aprelia of the District of Columbia. In Interference cames, the course of appeal from the decision of the Examiner of Interference cames, the course of appeal from the decision of the Examiner of Interference is the same. This compares

where the second process of the second proce involve indumnum or pages. With only time on the Board, the time has come when it is nec to do something in the way of relief, so that p and correct decisions may be handed down. Just the Board is several months behind its work. T toe source is several months behind its work. The re-sult is that to get an appeal through the Board of Enaminary probably requires three to few months time. The bill in question save so much time in getting a case through the Patent Office. It practically provides six men to do the work that three are son' trying to do, without any additional cost.

At the present time, the same work is done owner vices in the Pentent Office for a very good prancy. The theory of the present course of aspinals is than suffer the destinate of the present liberal of Manufesty-ito-Diale, there will jui an appeal to the Compulsations in person. It is impossible for the Compulsations of person, it is impossible for the Compulsations of Patents in present, as given force, assistant plants. At the present time, the same work is don twice in the Patent Office for no very good



these things which are appealed to him. He has to have the help of his Assistant Commissioner, and he bigs, things which are appealed to him. He has to have the below it his Assistant Commissioner, and he size has to have the below of two others. The attac-tion is a second of the second of the second of or the Beard of Resonance-la-Chief, the only chance of the Beard of Resonance-la-Chief, the only chance the Beard and setting together and forming at optains on a case is atter hearing the agra-ments which are leaded by the attorneys. The Beard of the Resonance of the Resonanc ments which are made by the attorneys. The Board these tries to come do some conclusion at that time If it does not, then the work is to be divided among the members of the Board, and each one has to prepare his abare of the coses, and these spikin his heart of the coses, and these spikin his heart of the coses, and the spikin his should be the beautiful that the beautiful that the beautiful that he beautiful that the beautiful

## A PERSONANAL OIL GUSHER,

The largest oil gusher in the history of Californ to May 3rd it had delivered about 2,000,000 barrels

productivity During the two weeks following March 21st, 1910, more than one-half million barrels of high grade crude petroleum had been collected from the The stream rises intermittently from 170 to 240 feet above the top of the derrick, which, before the crown or top was carried away by the stream
of oil was 84 feet in height. The oil sands were the crown or top was carried away by the stream of oil, was 84 fect in height. The oil sands were struck at 2300 feet, at which point a tremendous gas pressure was uncountered and the drillers were sud denly amased at seeing small rocks huried hundreds of feet in the air through the eight inch casing. After the oil sands were struck, the well rapidly "drilled itself" to a greater depth The well promises to keep spouting fo

The well can be heard rearing for more than a mile. Spray from the gusher has been carried a dis-tance of two and a half miles, and hundreds of auto tance of two and a half miles, and hundreds of authoribles have carried sighteers from Bakernfield to witness the unique sight. The same brank for a distance of half a mile around the well is coated with oil, and several jack rabbits kittled well in the origin of the property of the grader has been proved unwalking, the force of the property of the derrick and fifteen feet of its uppermost structure, and the tremendous flow created a huge lake of oil extending for hundreds of feet on every side of the

From a money viewpoint the gusher is said to be the most valuable in the world's history, far exceeding the famous Texas gusher in the Beaumont field which caught fire and subsequently ran into salt water, for the owners of the Lakeview had netted by March 3its over \$300,000 from the oil, which is now being piped to tidewater from Maricopa in the San Joseptin valley to Port Harford on the Pacific count, a distance of 150 miles.

To control the oil from the susher was in itself no To control the oil from the guales was in itselfs as slight achievement. Shortly after the great stream annased the drillers, three pumps with a combined capacity of Spoob barries daily, were started working at top speed, pumping oil out of the sump-hole, and the oil so recovered was the first oil to enter the huge take built by the findependent producers of Califor-

The big well, which is one of the seven guahers 'Draught in' in the Coalings and Midway-Maricopa oil fields of California within the past month, is due on Besids of California within the past month, is due to the persistency of a single man. A discouraged beard of directors, three days before the gusher was struck, deeled to quit drilling. The order was given, but the superintendent conveniently farged it. He drilled if feet more against penalty of disminant, and figs bit entered the oil made.

the bit entered the oil made.

"To date all effects in city the well have proved un-publing, and the oil is now rushing heavenward both as the inities and the copied on the steal entage.

It is an interesting that that lately the gravity of the, oil; has risen from 11° heaven to 20°. This is to just the contract of the contract of 20°. This is held; taken to infected that the oil is now bring drawn large, a force subsidies or "pool."

### Scientific American

## Correspondence.

WRIGHT DISPOSITION IN ARROPLANCE.

to the Editor of the Scientific America.

In your tame of April 30th Mr Godfrey assumes that the center of suspension and center of thrust are cotheide , center of gravity low, and center of presistance to the lateral motion in vertical rudder high

In an aeroplane with perfect stability the center in an aeropame with perfect stability the center of gravity abould be low, the center of thrust below the supporting plane yet in the center of resistance to forward motion and the vertical rudder below the center of suspansion yet at the center of resistance to lateral motion. In my monoplane the operator by shifting his weight slightly can raise the inner wing in making the turn MORES FRANKLIN

Grand Junction, Colo

## WEED-COTTING BOATS.

To the Editor of the Schwitze American
I have been a constant reader of the Schwitze
American for, I think more than thirty years—back as far I can remember, anyway In the issue which I received Saturday, I noticed an illustration of a weed-cutting boat and a description sent by your Paris correspondent. While I do not know that there is a specific statement in the article that it is a new scheme certainly one can only gain that inference from the

ading
While I do not remember to have seen a weed-cut ting boat exactly similar to that one, they have been in use in this country by many of the ice companies for many years. The Consumers' Company of this city, of which I was vice-president and general manager for a good many years, something like ten years ago buil a boat at their own works for this purpose and while a boat at their own works for this purpose and shifted owing to the fact that assoline engines were not their so universally used as at present atent power was cutting kilving, yet its purpose was the same and it accomplished the same end and in my judgment was in some respects better than the French device. As I remember it, we merely built a flatboat about ten feet wide and forty feet long. We mounted the wheel stern, after the manner of Mississippi Rive steamboats, instead of at the bow as in the French boat and we placed the cutting knives a the box They were about the same type as those used on mow ing machines and were operated by the same engine that propelled the boat. We morel used a small up that propelled the boat We more) used a small up-right boiler and a single-cylinder vertical engine for power, transmitting the power to the stern wheel by chains and to the cutting knives by bevel goars and Right at the front end of the boat (onvent abaffing Right at the front end of the boat conveni-ent to the pilot, was a clutch for throwing the cutting knives in and out of goar. The knives were raised and lowered by a goar controlled by the same person. This boat at times was run by one individual. Of course, it was better to have two-one as engineer and the other as pilot. It was arranged to cut to a depth, I think, of four feet

I know of several boats of this same character u I know of several boats of this same character used by various secondants and I think in one return they are very much better than the French boat as the euting knive are in from, and the pilot know just what he is doing all the time and of course, he can run the beat very much shallower he caps of the cut the weeds out in very much shallower sater. Then again, the French boat runs other beat were the shore the course of the rashes, pushing them down possibly so that the weed cutting knives would not cut them at all Chicago, Ill

Booth of Prof. Augstrom.

The well-knows Swedish physicist, Dr. Knut Ang strom, is dead. To the general public his passing will mean little, because his investigations were not of the character that attracted public attention. To the

the character that attracted public attention. To the celemitath is death means an aid case for in him physics has been deprived of one of its abbest investigators. The control of father, Johan, achieved frame by reason of his sphendid study of the solar spectrum Ills gam. Knut was born in 1807. He studied at the University of Upsain, where he afterward taught. Ill occupied a profes-count of the time of the control of the control of the control of the time of the control of the control of the office of spectroscopy. By means of the spectroblometer

sorial chair at the time of his death
Angstrom's first researches were made in the field
of spectroscopy By means of the spectrobolometer
he studied the phenomena of absorption in the infra
red spectrum, notably for carbon monoxide, carbon
dioxide, water vapor and osone These investigations gave rise to an interesting controversy with Arrhe-nius. Water vapor, carbon dioxide and ozone have a marked influence on the temperature of our globe In effect, they partially hamper the radiation of the earth into inter-stellar space and thus sid in main laining the surface of our planet at a temperature compatible with the conditions of life. With these fights up a basis, Arrhenius built up an ingenious

theory to account for the glacial period. He suppo that the quantity of carbon dioxide contained in our sphere has increased since that period strom proved that Arrhenius' reasoning was valid only for carbon dioxide of almost infinite tenuity and that the possible variations of the tenuity of carbon dioxide in the air could not possibly have had any influ on the temperature of the earth

Angstrom's name will be forever linked with the study of solar radiation. An instrument which he in vented for the purpose of measuring this radiation and known as the Angstrom pyrheliometer is now widely used in observatories.

The (arrent Supp

The government dam across the Salt River at Room teit, Arizona is nearing completion after about six years of active work. The dam is excellently described and illustrated in the opening article of the current Super-Mayer No 1794 by Edmund G kinyon in an article entitled "New Methods of Polar Explorations the forth oming expeditions of I leut Withelm Filch ner and Capt Scott are described in detail as well as ner and Capt Scott are described in detail as well as other expeditions. The current problems of most in-terest to those engaged in the branches of science associated with marine construction are usually brought into high relief at the annual meeting of the noting in the light refer at the annual mesting of the Institution of Naval Architects. In the present year this has been particularly the case A summary of the Institution a proceedings is presented. The Insuguration of the Oceanographic Museum at Monaro took place on March 28th in the presence of representatives place on March 28th in the presence of representatives of the governments of France Germany Italy, and a great gathering of men of all ance of all nations who were invited by the Prince of Monaco. The museum is made the subject of an increating illustrated article. Dr. E. E. Barnard of Verkew Observatory has made as special study of the automatic field of the properties leys comet will I as directly between the sun and the earth and its tall will sweep over and envelop the earth. In this connection it is interesting to note the earing in this councilion it is interesting to note that a miracle book of the sixteenth century mentions the pash. 3 of a very large comet between the earth and the sum and a phenomenon apparently connected therewith The (frommatnews of the passage as given in the work are published. Perhaps the biggest comet. in the work are published "ranjw in niggest comer of the ninetwenth century was that of Donati which appeared in 1858 At the time Charles Dickens was Editor of Household Words in the pages of which magazine there appeared an interesting article on the appearance of the comet—interesting because of its attempt to present the phenomenon in a popular way and also curious in the light of our more advanced cometary knowledge Visible Molecules Corpuscles, cometary knowledge Visible Molecules Corpuscles and lone is the title of an article in which the mod ern theory of matter is discussed

## A Stabilizer for Aeroplanes.

Regnard has designed an automatic device for steadying the flight of un neroplant in which use is made of the invariability of the axis of rotation of a made of the insatiability of the axis of rotation of a gyroscope For stability as un eroplane however it is not necessary to have a gyrosist of great mass, act ing directly upon the axis of the aeroplane. A small gyroscope, weighing only a few pounds suffices to establish the tric contacts in the frames which contains it. By means of these contacts currents are sent through motors which operate the steering organs of the aeroplane Two motors are required for this pur ut they may be very small and light be they act upon the rudders by means of levers nerd has not yet had an opportunity to apply his in vention to a real aeroplane but he has submitted to the French Academy of Sciences a model of an acro the French Academy of Sciences a model of an acro-plane about three feet long resting on a box which contains a gyrostatic stabilizer. When the system is inclined in any way the steering organ, whose function it late restore the axis to its original position, is at once automatically act into motion.

### What One Firm Pars for Patents.

A recent report of the General Electric Company covering the period of the eleven months ending Decovering the period of the eleven mouths ending De-cember 31st, 1999 consists some runarkable figures. During the facal year the company paid for patients and patent litigation the sum of \$900.50° which sum is not counted as an asset but is charged over to profit and loss. All the company a valuable patents fram chiese and good wills stand in the balance sheet at a nominal valuation of one dollar

Mr Richard Blees an inventor who did much t achinery of various kinds, died recently a improve machinery of various kinds, died recently at Richmond Hill, Long island, at the ripe age of 9: years He patented the Culver awitch and the first scaling indder used by the New York Fire Depart ment Hydranic water pressure systems for sky acrapers and improvements in sewing machines are a to be credited to him

# THE MANUFACTURE OF TWINE

BY DAY ALLEN WILLEY

What is generally known as hemp twine, used in such enormous quantities for various purposes, is manufactured from two varieties of aber known as Manila and Sisal Needless to say the first named comes from the Philippine Islands forming one of the principal products of this possession of the United States while the Sissi is secured principally from Mexico the Siste of Yusaan contributing the larg est supply. An idea of the extent of Manila hemp manufactured can be gained when it is stated that each year no less than 125,000 tons are shipped from e city of Manila most of it coming to the United

The aber from the Philippines is obtained from a

verted into fiber. This is done by the usual method of decortication. The material is fed into the receiving hoppers of the mill by means of an endless conveyer, the leaves being laid upon the surface of the voyer, the leaves being kild upon the surface of the conveyer side by side By means of tootlod wheels they are cut lengthwise into shreds. In this state the material is passed through mechanical cleantry which remove all of the pulls. Next the fiber passes out of the decorticator and is carried to yards adjacent to the mill, where it is hung upon lines and dried by reposeur to the heat of the sun This process con cluded, it is pressed into bales of conven is then ready for shipment to the United States. already stated, the preparation of Manila fiber is done

almost entirely by hand, and bealmost fore being export ed it is also dried ed it is also dried in the sun, the natives using long poles, how ever, instead of rope or wire as at the Moxican

Mantla and Sizal fiber into the



The state of the s

species of the banana family, which attains a height of fifteen or twenty feet. The stems of the separate leaves grow in a close cluster ing what appears to be a solid tree trunk, to the height of ten or twelve feet, where they separate and branch out like the limbs of an ordinary

natives out these stalks off The natives ut these stalks off near the ground removing the leaves from the top of the stalk, then repeated in the stone and respectively drawing it arrow the edge of a dull blade pressed on a block of wood This primitive method or cleaning the Manlis fibr has not as yet given place to modern method. The work of the decision of the dull the stalk of the decision of the decision

This work of growing and cleaning the fiber is con fined to the mountainous districts. After the fiber has been dried it is packed in convenient sized bun dies and brought down to the coast villages where it is purchased by exporters, who sort the fiber and press it by machinery into bales convenient for ship-ping. These bales are protected by mattings woren or platted from rushes by the natives, and are secured by ratten bands

The Henequen plant furnishes the Sissi fiber which The Henequen plant furnishes the Sissal Sher which is brought to this country. The plant bears a re markable resemblance to the well-known century plant and is frequently mistaken for the latter on account of its appearance. As it forms one of the principal products of Yucatan the Sizal plant is cul tivated on large plantations, principally by Indian labor The young plants on these plantations are set out in rows about ten feet apart. About the fifth or sixth year the plant is sufficiently matured, so that the under and larger leaves are cut, and the pulp removed by decortication, leaving the fibers to dry the sun, they are then baled ready for market The plant continues to grow and produces about a dozen mature leaves each war. At the end of a period ranging from fifteen to twenty years the plant dies, and is replaced by a young one
The method of gathering the Sisal and shipping it

The method of gamering the Sussi and snipping it to market is much more estimated than the process employed in the Philippines, for nearly all of the Sisal plantations have transways extending through the Henequen fields, so that as fast as this curious harvest is gathered it can be leaded directly on cars and drawn by mules to the factory, where it is con-

Machines for balling the twine.

is performed by practically the same process. The interior of the modern twine fac-tory is somewhat similar in appear-ance to that of a modern cotton mill, with the exception that some of the machinery utilized in the lat

titlings in the latter is missing This
Is due to the fact
that less care is
required in the preparation of the fiber for spinning, since its appearance usually does not increffle the value of the finished product. As is well known, the preparatory machinery in a cotton mill is by far the most elaborate apparatus installed. It includes the opening and scutching machine, by which the material sed from dirt and other foreign partic the fiber is not a mass of that like raw cotton, this mechanism is not required, nor is it necessary to form it into bats preparatory to carding In the modern vites mill, however, the fiber is passed through mechanism which is somewhat similar to the carding spite and performs the same duties, disentangling the fiber by means of revolving cylinders provided with cards which are suitable for treating much corrier material. When carded the fiber is drawn into a control of the card of the fiber is not a mass of lint like raw cotton, this

0.0

movable racks or the floor. This is the first process in preparing the bemp—for such it has now become—for spinning, but before being conveyed to come-for spinsing, but before being coaveyed to this apparatus, it goes through what is called the finishing matchin. This combines in part the draw ing and subship frames of the cotton mill, so the been considerably reduced in size and is allowed has been considerably reduced in size and is allowed, twisted, enabling it to be coiled in cans, from which it is fed to be spinning framies. While the apinning matchine is of course designed for treating this flow encountry. splaning machine for course designed for treating this liber especially, it is as automatic in its open-tion as the motorn satisfacting mechanism, and pi-tion as the motorn satisfacting mechanism, and pi-tion fainted product than its required in the mana-facture of yars and thread from the ordinary cotton. The twine spinning machine includes drawing roles for longthening the allow; the material as it is made to the contract of the contract of the course of the form them being twisted by the action of the appliable from them being twisted by the action of the appliable mounted upon carriages which adjust themselves at

As fast as the twine is spun it is also wound on a large spool or bobbin the latter being taken to the balling machine as soon as it is filled with the twines.

The balling machines are also automatic in their operation, not only winding the ball from the bobbins. operation, not only winding the ball from the bobbing but discharging the finished ball automatically whose it has reached the proper dimensions. These mas-chines are siculated to wind balls weighing five pounds each where the twine is used in connection with binders and other agricultural machinery, the balls being packed into cases bolding ten each.

At the McCormick plant, which is illustrated in the accompanying engravings, several grades of hemp twine are produced, one of which includes the mix ture of Mexican and Manila fiber, as this is found to be very durable To show the difference in the of the material it may be said that a pound of such twine contains 600 feet. The twine made en tirely from Manila is slightly floor and averages 650 feet to the pound, while the Bissl is the coarsest, averaging 600 feet to the pound

Educating the Parmers by Rail,

California sees a way to solve the food problem by educating the farmers.

She believes that the farmer is nover too old to



Bales of twine ready for shipment

## THE MANUFACTURE OF TWINK.

She also believes in teaching the young to be farm-

Accordingly, the State maintains a college of agriculture, a university farm, polytechnic school, United States experiment stations, etc.

Now she proposes to introduce the study of agricul-ture into the public schools of the State. A substantial beginning in this line has already been made in the establishment of the study in the

high schools, later on it will find a place in the

primary and grammar schools.

Then California has its farmers' club, granges, and farmers' unloss scattered all over the State, and these corganizations exercise a large influence upon the educational thought of the day.

cational thought or the say
Every year some hundred or so have institutes are
held in various parts of the State and yearsh anguality
between 20,000 and \$8,000 farmany.
California has the best ormanance horizontages, spen-

tion in the world, comprising a central office and a insectary at Sacramento and a quarantine de-ment in San Francisco. State in parts

Each county covering a horticultural section also has its own local commission, inspectors, etc., while t fruit growers hold two State conventions annually

These all wield a strong educational influence and add largely to the sum of farm knowledge in the

But the latest and most striking feature of Cali fornia's campaign of farm propagands is the so-called "Agricultural and Horticultural Demonstration Train."
This train is the joint work of the California College

of Agriculture and the Southern Pacific Company, the one supplying the exhibits and corps of lecturers and

This led to the organization of the "Agricultural and orticultural Demonstration Train"

Horticultural Dem And it only needs a glance at California's industrial statistics to convince one of the truth of this charge

or wasterul nesonatory.

California thirty years ago was one of the leading wheat-producing States of the Union. In the year 1879 its wheat output amounted to not less than 1-707,800 tons, in 1994 the annual product of wheat had dwindled to 465,028 tons, a shrinkage of more than

seventy five per cent.

California was formerly a great exporter of wheat and flour. In the year 1882 she exported not less than

1.128,031 tons of wheat and 919,898 barrels of flour In 1904 her exports of wheat had dwindled to 54 381 tons and flour exports to 882 486 barrels. To-day both the ex port of wheat and flour are wil

import a million dellars' worth of wheat annually in order to keep her mills running, and her flour up to standard grade And all a result of poor

farming, as is evidenced by the fail of the average annual yield per acre of wheat from forty to less than fifteen ticultural lecturers cover a wide field, including plant culture, plant diseases, and plant peats, viticulture, ani-mal industry, dairying, seeding and soil treatment, etc. secial stress, however is laid upon the vital im

portance of restoring the lost fertility of depleted soils and the maintenance in their composition of that and the maintenance in their composition or una-vital element known to agricultural sciences as hu mus, all of which has a direct bearing upon the increase in the production of food-stuffs sufficient to supply the demands of a constantly increasing population

## Pire (ontrol in the National Forests

Probably one of the best things in the line of an agreement has just been algaed by the Secretary of Agriculture and several railroads whose lines run ignide of the national forests. Two of the largest and longest roads in the Northwest (the Great North ern and the Northern Pscific) have right of way through some of the richest timber districts in the

West and this agreement is of great benefit They have in view both the reduction to the lowest point of fire risk from the operation of the railroads and joint action by the Forest Service and the rail roads to fight all fires which may start along the lines. Both companies have agreed to clear and keep clear of inflammable material a strip of varying width, ss conditions demand, up to 200 feet beyond the right of way, and to provide all locomotives which do not burn oil, with suitable spark arresters and other

standard equipment to prevent the drop-ping of fire An effort will also be made by the companies to so operate their en gines as not to cause fires.

gines as not to cause fires.

In fighting free the railroads and the Forest Service will co-operate closely Noti fication will be made promptly to the Forest officers of all fires discovered by employees of the railroads Telephone wires to make this possible will be put up



demonstrators, and the other a fully equipped railroad train comprising three exhibit cars, a lecture car, a sleeping car and diner, all absolutely free of cost to

The work of the train is arranged in a series of annual tours, covering all the leading agricultural and horticultural sec-

s of the state ach series consists of five separate tours, each tour covering from 500 to 1,000
miles, and from twenty to twenty five stopping places. The work of the train begins in the late

fall and ends in the late spring. It does not specialize like the demonstration train of the East but covers all

the leading lines of agriculture and horticulture
Its corps of lecturers contains some of the ablest
members of the faculty of the College of Agriculture, and the president of the university, Benjamin Ide Wheeler, frequently joins the train in its course, and lends his aid to the work of general farm enlighten-

The Southern Pacific Company very candidly admits its own interested motives in the premises, and frankly explains that it discovered a serious falling off in its local tonnage, and when the matter was in vestigated it was discovered that the shrinkage was found in the item of farm produce

They consulted their local freight agents as to the underlying causes, and were told that the principal cause was an exhaustion of the soil

This was hardly believable, and the company con suited the soil experts of the College of Agriculture who denied the theory of exhaustion, but explained that the soil had been depleted by a practice of pocultural methods.



mbing out the hemp preparatory to shipm

It is this era of wasteful farming that California desires to put a stop to, and hence in augurates her campaign of agri cultural education

The "Agricultural and Horti-

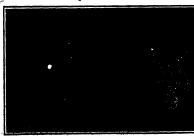
rine "Agricultural and Forticultural Demonstration Train"
is developing unlooked-for efficacy it was originally latended for the enlightenment of the
present generation of farmers, but its inducace is
being carried beyond that limit, it is being brought to bear upon the rising generations, and the young folks are fully as much in evidence at the lectu onstrations as the older ones

At each stopping place for lectures the local schools of all grades are dismissed and the pupils allowed to attend, a privilege that is evidently appreciated by all attent, a privilege that is evidently appreciated by all They crowd the demonstration cars and heture car, attend open-air lectures, lectures and discussions in neighboring school rooms, public halls, and opera houses, and are found in attendance whether the gathering be in the daytime or in the evening



Winding the material into canisters for spinning.

by the Forest Service using the companies' poles where this is possible Warning whistles will also be sounded by loo modifies on occasion Forces of fire fighters will be assembled on the out-break of fires, and will be made up of Forest officers, railroad employees, and such temporary labor as can be gathered by either. The cost of fighting fires which start within 200 feet of the railroads will be borne by the companies and of all others by the Forest Service, unless it is shown in the first case that the railroads were not responsible or in the second case that they were responsible for the outbreak of the fire the intention of the Forest Service to patrol the rights



Mantin home; the raw majorial as it comes from the ship.



Preparing the homp for spinsing



# DAMMING THE MISSISSIPP

BY W. P. GREEN

Excelled only by the monster dam across the historic Nile River, the greatest ingineering feat in the natory of the Manda Wax is unter vary out to east stadppl at Keckuk loss the point from which Col Rossvelt started his river journey to the far Wat several years ago. A huge dam is being built across the Mississippl at the foot of the rapids which lie to the north of Krokuk, and the stored energy of to the norm of a count, and the stored "neep" of the river is to be used in generating over 200 one electrical horse-power. The power will be distributed throughout the Middle West, the first long distance transmission line running to 8t Louis 170 miles. south of Keokuk where forty per cent of the power to be developed is now under contract. The bed of the river at this point affords an excellent rock foundation.
The dam will be built of reinforced concrete, and
over 500,000 barrels of cement, and 7,000 tons of steel required in the construction of this gigantic

he dam, including abutments, will be 4700 feet

of 43 feet. On top of the spillway will be placed 116 steel flood gates, 30 feet wide and 11 feet high, supported by concrete piers. The piers are to be built integral with the dam, being carried down to bedrock on the upstream aide. They will support an arched bridge, from which the gates will be operated by electric hoists. Through the manipulation of these gairs the water above the dam will be maintained at n constant level at all seasons

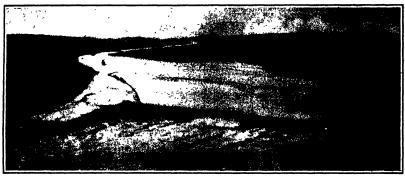
Four fifths of the dam, the 4,400-foot section, will extend in a straight line across the river, breasting the current of the broad river. The balance of the dam will be built approximately parallel to the shores and at right angles to the main dam. This portlon, i 100 feet long 123 feet wide and 133 feet high, will be occupied by the power house. The substructure, built of massive concrete, will contain the water passages and waterwheel chambers. Upon this will be the superstructure containing the electric generators, transformers and switchhounds. There will be thirts

the power house, will be the revolving parts of the

generators. To keep fonting loe and logs from entering the power house, an foe fender will be built upstream from the upper end of the power house, curving in toward the shore This will be 3,800 feet long and built of concrete masonry.

The construction of the dam will entirely destrthe government canal, built to carry shipping around the rapids. This canal new consists of three locks. In its place a single large lock will be built. There in its piace a single large lock will be out. There will thus be substituted for the causal q lake of deep water over a mile wide at the dam, and 40 miles long. The government has given permission to build the dam, Landowners on both sides of the river will be given a fair price for all land overflowed as the result of the creation of the reservoir

The construction of this gigantic river project is under the direction of Hugh L. Cooper of New York city The work of excavation is well under way on



This happ structure, over a mile in length is being built across the Mississippi at Kookuk, Iowa. The dam, which is broadly similar to the Assonan fam across the River Nile, is provided with 110 food gates to could be height of the foods. A lake 40 mum long will be formed and ultimately 200,000 electric horse-power will be generated in the power house shown at the laft of the dam.

## THE RUGE DAM WHICH IS BRING RUILT ACROSS THE MISSISSIPPI

long, or seven-eighths of a mile. The spillway section will be 4,400 feet in length. The dam will rise 37 feet above the river bed, and the base has a width

power generating units each consisting of a vertical sirel shaft, carrying on the lower part two turbines, or water wheels. On the upper part, on the floor of

the Illinois side of the river, the project will be pushed as fast as the material is delivered at the site

## The Commographic Museum of Monaco.

The Oceanographic Mineum of Monaco was form ally opened on March 29th, 1910, by its founder, Prince Albert I of Monaco, in the presence of representatives of various foreign governments. The celebration in cluded a pyrotechnic exhibition and an allegorical pageant in the beautiful bay of Monaco, a gala per formance at the opera and other festivities. The new museum, which is also a laboratory, is connected with the Oceanographic Institute of Paris and both institutions, with an endowment of four million frauer (\$800 000) have been presented by Prince Albert to in recognition of the hospital the French governm ity which Paris and France accord to all workers in the field of thought Prince Albert is president of the administrative council of the Institute, which in the administrative council of the institute, which in cludes among its members at President Loubet and the physicists Cailletet and Becquerel The direction of the scientific work is confided to an international committee for it was Prince Albert's design to found an institute and a laboratory in which investigators of nalities could work together for the advan ment of the new science of oceanography The lecture courses of the Institute were inaugurated in 1803, at the Conservatoire des Arts et Métiers. The lectures been given in the old building of the Acad emy of Medicine and at the Sorbonne. The new building of the Oceanographic institute will soon be completed, and the lectures will be given there after

The Oceanographic Museum of Monaco, which has aready received the popular name of the Paince of the Sea, is built on the flank of a steep cliff at the edge of the Sea. On the water side the building is 255 feet high, while the height of the main rande on the land side, is 148 feet, the difference being due to the

slope of the cliff The length of the building, parallel to the water front, is 330 feet. The cost of construc-tion exceeded \$1,500,000. There are only four stories, and the rooms are very high, large, and well lighted The two lower stories which are partly underground. contain the aquariums and laboratories, while the up-per stories are devoted to the exhibition of sounding and other apparatus, and of the rich and varied collections of deep-sea fauna and flora which represe result of a quarter century of exploration Princ Albert has also placed a small steamer, the "Eider," at the disposal of the Museum

at the disposal of the Museum Almost every year since 1886, the Prince of Monaco has made a scientific cruise in the Mediterranean, Atlantic or Arctic Ocean The experience acquired has made a scientific cruise in the Mediterranean, Atlantic or Arctic Ocean The experience acquired with the "Hirondelle," a salling secht of 200 tons, and afterward with the "Princesse Alice I," an auxiliary three-masted schooner, 170 feet in length, was put to good use in the construction and equipment of the "Princesse Alice II." with which the later cruises have been conducted This vessel has a steel hull, a length of 240 feet, a breadth of 34 feet, a displacement of I 400 tons, and a maximum speed of 13 knots. It to tains the most improved apparatus for taking soun ings and temperatures and collecting specime fauna, flora, sand, mud etc, at very great depti great part of this apparatus was invented and con

great part of this apparatus was invented and con-structed by the Prince and his assistantic. The cases of the Museum contain representative of all known deepnes fauna. Many of their speci-mens are interesting even to the non-selectific ob-server because of their strange forms, heastful colors, and poculiar organs of sight and touch. Three occanographic explorations and collections also possess great practical value, in addition to their

also possess great practical value, in addition to their scientific interest. Most edible fishes feed upon the

plankton or mass of small animal organisms which are wafted hither and thither by even feeble ocean currents.

The explorations have proved that the plankton moves in a manner dependent on the season and the locality These migrations appear to be governed by complex laws, the knowledge of which, as it is grad ually developed, will be of great value to the fisheries, especially to the steam fisheries, as the fish follow the plankton

plantion in commemoration of the inauguration of the Ocean carpable Museum, the Prince of Monaco has custed and the Commemoration of the Prince of Monaco has custed to god plaques were presented to the president of the French Republic, and the soversigns of Germany, Italy, Spein, Portugal and Monaco. One hundred plaques in aliver and twenty in bronne were distributed among the Other invited general—Uffluerization.

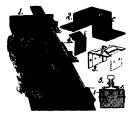
The Historical World remarks that in a report submitted by the other signal officer of the Westell States army to the Scentarior of the Army scentarior the Scentarior of the Army scentarior to the Scentarior of the Army scentarior to the Scentarior of the Army scentarior of Scentarior of the Army scenarior of the Army scenar





## TEPROVED BAIL CONVECTION.

To prevent the destructive bammering of the rails when depressed by the passage of a train, a new construction has recently been designed to furnish a more substantial support at the rail joints for them it



IMPROVED RAIL CONSECTION

censitat in providing timbers or the running long-tudically under the ralls at the joints. In addition to this, a number of very substantial metallic fiastenings severe to clamp the ralls itself by no setting severe to clamp the ralls itself by no position in a unually the case that the joints of a railroad are and heavy fishipates are depended upon to support them. The construction here lithustrated is intended to ofter an improvement on such an arrangement of the joints. As shown in the arcompanying engraving, the two ties A, between which the joint comes, are depressed, and on them is laid the longitudinal timber B The latter is clamped down to the ties by tim Fig. 3. This is substantially at Uform, and may be remed a "audit piece." It is preferably mortized into the timber B the latter is clamped down to the size by the present of the control of the present of the ties by means of a model piece. The preferably mortized into the timber B by means of a metallic fiastening D such as shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 3 and a pair of frastenings B, such a shown in Fig. 4 Pig 5 is a cross-sectional view of the rail, both, and shown how these frastenings B and the provided, which is the option, which energies the interview of the statement B of the frastenings B, the frastening D being cut away to receive the manufacture in the frastening B, the frastening D being cut away to receive the manufacture the supplemental the more don't be such as the frastening B, the frastening D being cut away to receive the manufacture the supplemental the more don't be such as a such as the provided, which

## PRHCE POST ANCHOR

A patent has recently been granted on a novel method of supporting a tence post, so that it will with stand excessive strain. The construction will be especially useful for suchoring corner posts. The device is very sample and inexpensive and may be readily at teched to say post in our illustration, we show if yield it to construction applied to the ordinary fonce



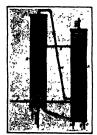
THE PER LA PROPERTY.

designated by the letter A. At the bottom of the post is an another plane A, which at one end is finitemed out to form a blade O. The opposite and of the anchor plate is doubled upon itself to receive the lower of a diagonal brace B, the upper end of which is bottod to the post. An angle brace B is nevertied to the opposite side of the post and connects it to the opposite side of the post and connects it to the anchor plate B. The spikes which pass through the anchor plate a The spikes which pass through the anchor plate for long the spike plate from the anchor plate for long the spike plate from a finite plate from a server as additional means for preventing the anchor plate from alleing out of position. In one a trunch is dug at the point where

the opposite side of the post and connects it to the anchor piate B — The spikes which pass through the anchor piate are long enough to be driven to a conservable depth in the ground, and serve as additional means for preventing the anchor piate from sliding out the part of the part is to be erected. The through is just wide enough to receive the anchor piate \$\eta\$, and the binds of the piate is to be erected. The through is just wide enough to receive the anchor piate \$\eta\$, and the binds of the piate is to be erected. The through is just wide enough to receive the anchor piate and the send of the trench, thus affording a firm anchorage. Thereafter the post is erected on the anchor piate and the braces \$D\$ and \$B\$ are boiled fast. For corner posts, the anchoring derive is used in duplicate. The binds of the such piate and driven into the ground at the side, where there will be a lifting artent inspeed by side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side, where there will be a lifting artent inspeed the side of the s

AMMORIA FURITIES FOR REFERENCE PLAYS.

A recent patent discloses an improved method of purifying ammonia, so as to reader it anhydrous in refrigerating plants. The object is to produce a high grade of subdytous ammonia continuously while the compressor is in operation. An apparatus is provided which is connected in circ uit with the compressor and condenser and removes a portion of the best from the compressor and memory and portion of the post from the compressed ammonia so as to condense the oil and water vapor and permit dry or partially cooled but uncondensed ammonia to be delivered to the concendance oil in this way the amount of cooling that



APPARATUS FOR PURIFYING AMMONIA FOR

is required in the condenser is reduced. The passage of oil to the condenser is prevented and the ammonia is condensed sparatially, so that only pure anhytrous ammonia is delivered to the expansion valve. The apparatus compress we holders or drains A and B which are connected at the bottom by a pipe C. This was a connected at the bottom by a pipe C. The compressed ammonia enters the drain A, through a pipe B then passes through one or more connecting pipes B to the drain B after which it passes out through the pipe F. The cooling system consists in a pair of water chambers of and a pipe B, connecting the top of the water chamber in drum B with the bottom of the chamber in the furu M. The safer passes through the cooling system in the reverse direction to the flow of ammonia through the apparatus. The temperature and rate of flow are so controlled that holders, but all the oil and water waper which may be carried slong with the ammonia will be condensed in these holders and excuminate in the lower portions If the valve in the pipe C is opened, the oil and water in the drum A is to best the oil and water will flow into the bottom of the drum A and may be draven off at that point. The object of letting the water in the drum A is to best the oil and water to the drum A is to best the oil and thus prevails and the province of killsouri A veloce and Millsouri A veloce and a veloce and water in the veloce and water in the veloce an

## CONVERTIBLE BOAT AND TENT.

OFFICIALE FOAT AND TENT.

For the benefit of campers, hunters, and the like, a folding tent has recently been devised which may be pecked late a very small compass and which may also be soatered into a canvas boat. Our illustration shows the device in its two forms, partly broken a way

to reveal the framework. It will be observed that the upper portion of the test comprises a pair of lasy toggs A, consected by trous har B. These are supported on four posts indicated at C and B, and the structure is readered quite rightly means of a system of gay wires. Swung from the framework are a tuper portion of the int frame is evered at this variety proof cauras, and in addition to this, there is a lower proof cauras, and in addition to this, there is a lower cauras section which may be featened to the upper section by means of buttons, thus forming a specious test, and the occupant cas also not not contained.



CONVERTIBLE BOAT AND TENT

which has decided improvement over nature the ground for a bed. When breaking rempt to pooke C and D are withdrawn from their sockis and the lary tonger folded up, so that the entire framework into a boat it is extended and inverted, so that the urons a bars B form the bottom of the boat that the vrose bars B form the bottom of the boat that the vrose bars B form the bottom of the boat the large three boats of the transverk at one end and fastened together at their native with a tone end and fastened together at their native is braved by a pair of arms M which are histories to start a set of the large to the

## INDEX STRUM FOR POCKET MEMORANDA

A patent has recently been granted on an Improved problect momerandium book, which is provided with a novel indexing system. The first leaf of the book is abouter than it in others and serves as a topic, itse, being ruied to allow of entering various topics on which most are to be kept. The other leaves of the book are cut with series of take as shown in the it instration the tals on each leaf corresponding in number to the topics provided for in the topic last when notice on a subject are entered on one of the haves the notice of the service of the servi

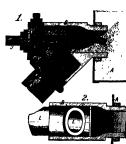


MEMORARDUM BOOK WITH BOYEL INDEX STATEM

the a card index no transcribing of the noise is necessary. The device should be of particular advantage to the modern farmer, horticulturist, gardener, or stock nam, who trust have softle convenient way of collating and preserving the data of his daily work if he is to get a ruli measure of profit and satisfaction out of his experience from year to year. He cannot affect of runs his memory with much support the control of the profit of the preserved does not appeal to him. The potent memorandom book thy topical flores about guest his needs. The institute of this memorandom book thy the profit of the memorandom book took Street, Isolatelle, Ky

## IMPROVED TRACE SANDER.

Pictured in the accompanying cogniting is an improved track another for use with foromotives. The appearation is an extraord, that two jets of compressed air art comployed, most of which is directed against the sand in the sand box, serving to agitate it, while the solid rate to folks harge the same continuously and smoothly Spuilal prevautions are taken to prevent the matter from being cingged with sand in our amount of the cast of the contract of the contr



IMPROVED TRACK SANDER.

Yeshaped casing is the pipe L, which leads to the point at which it is desired to discharge the sand continuous control of the point of

### BRIEF NOTES ABOUT NEW INVENTIONS.

The singing sign which has been recently placed in front of a forever business busine in a visual well as audible means of attracting the attention of passer-by. The neutritudes sign referred to displays thereof to atthes and is the best tric flashing type The illumination of one softer follows the other, and as it is improvemprising cach letter are flashed, a work lamps comprising cach letter are flashed, as who lamps comprising cach letter are flashed, as the lamps comprising cach letter are flashed, as the lamps comprising cach letter and believe to a different letter of a story of credental children for the comprising cach letter and the compression of a country of the country of the compression of a country of the countr

The libratinated civator threshold is a new means to prevent what is a quite common form of elerator section! The elevator attendant, making hundred of stops in the course of a day, is not always enabled to bring the car to a hait at the exact more large, and a very slight variation is sufficient to give the passen ger a joli if not more serious injury. The floor of the care being belof an inch or two above that of the

building is likely to trip the unguarded person about on eater the car, while persons stepping out are liable to be thrown down. The latest method of avoiding this is the teartion of a part or plate pine lease in the metal of the threshold, with an incandecest kamp under each. These are kept in operation all the time the car is in use. The lamps are supplied through the elevator cable in the same mannar as the overhead lamps. This device has been tried with seminent success in some moving-picture establishments, where the rear seals are slightly above the level of the skile.

The jobbing expenier moving around from one place is another, and locating for a few days at a time in one apol. In the cqurse of his peripatatic cares is compelled to spand considerable of his time in the construction of wooden horses or treaties, which are sensually so measurally not measurally for his work. These things are of such an awkward shape and size that it is out the question of the question to carry them from point to point, so he is compelled to built them in many cases before the in proceed with his work. To meet such demanda, horses of steel with collapsible for have recently been made, so that they may be readily packed up on the back of the treate when not in use and when on the back of the treate when not in use and when being transported, and in this form they are very compact. Being of angle iron, the treatie is not heavy and is almost everystating

### ODDITIES IN INVESTIONS.

HAT FARTYRE.—The recent agitation against long hatpins has et a Yankee investor to thicking. He has arranged a hatpin which has no exposed point and which does not have to be removed from the hat, but which may be operated to engage the half by giving it a bail turn. The hatpin extends from side to site of the crown of the bait, and is provided



A HOVEL TYPE OF HATPIE

with a series of hooks or grapples sharply pointed at the ends, so that when the pin is turned they will hook into the hair Whether the hat fastener has been tried in actual practice we do not know but it seems as if there would be considerable danger of entangling the hair in the curred hooks.

Device you beaving or any Bandonso Operation—An inventor does not have to go for affeld for observed upon which to exercise his inventive faculties. Even in the most rommorplace matters of everylay life there is room for improvement. Take, for instance, the mothod of removing one's overshore the musual way of teetering on one foot while trying to kick the shoo off the other foot is most sewward, to say



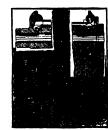
DEVICE FOR DRAWING ON AND REMOVING

the issue Recently, an inventor has devised a little attachment for the came or universite, whereby one can stand firmly on one foot and steady himself with the unbrella while removing the overshoe by pressing the lug at the back of the overshoe against the attachment on the unbrella. The investor has provided a



more elaborate device to hold the overshee in place while directing it on. The log at the held of the ownshoe is so formed that it on he engaged between a pair of jaw clamps, one of which is fixed while the other is princepotated. The drives is applicable to a case, and running from the movable jaw to within a coversiont distance of the head of the came is a

a cane, and running from the merable jaw to within a convenient distance of the head of the cane is a rod, which may be litted to release the jaws. Lucarnova Gurs Steurns.—When using a gun in the dark or deep twilight, it is very difficult to secure accurate aim, because the sights are invisible This difficulty has frequently been experienced by sentries,



LIMITEONS STORES FOR PWILIPET SHOOTING

no should be able to cover an approaching ensemy with accuracy, in order to secure belief own analyte aw well as that of the camp. To enable this to be done, an invention has recently devised ag un in which the sights are luminous. This is effected by means of a pair of small electric lamps lighted by batteries placed in the stock of the gun. The sections lview in the accompanying out above how the lamps are arranged. The sights are formed with priman, which at their lower ends communicate with chambers in which the lamps are located. The lamps are it only made to the lamps are located. The lamps are it only not become to the lamps are located. The simple are it in the lamps are located. The lamps are it in only most because for the section of the enemy for the sector, to expose his whereabouts until he is ready to five. The sights are of such a nature data they may be used in the daying with the lamps disconnected, a switch being provided for opening or closing the lamp circuit.

for opening or clossing the lamp circum state of the Survey real S



SPIPORT FOR PLEOTRIBALLY MEATED PLATERIES.

the heel. These are adapted to engage the cities when the Iron is in position on the slate, This completes the circuit through the ceits, and severe to heat the tron. As noon as the Iron is removed from the sport for circuit is broken, and through its owner, and or or designeous weglessing make to cause a first opening

## REGRETLY PATRICULAR INVESTIGUES.

TRADTOGRAM PROVIDENT A. I. GOLDEN, United BY THE APPOINT A. I. GOLDEN, United BY This instrument is for said in copyling writion matter or drawing by electro-nagmetic means. An object of the in vention is to provide a device by means of which a person at one station may write a lect tar, sign his name or extents a drawing, which a similar device will reproduce at another station in the form of an exact despitate.

## Of Interest to Farmers,

Of Interest to Farmers,
IN.HIGREF DEAFT MRCHANISM—II
MERSKAN, Kentland, Ind "This invention has
reference to draft mechanism or draft part on
pating a number of horse or similar draft at in
main to be attended to a plow or other in
plument, and provides a construction while
till equalize the leverage and publing force or
offer by the different animals.

speed by the different animals.

[GRAIN SHERADER AND FERDER — A

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see in connection with the freding of headed

grain, which, were under the most favorable

conditions of service, frequently "sing" the

cultions.

cylindee: CHURN-W F S SETTUDIAL, Sellabory, N C In general the haveallon may no defined below the control of th

### Of General Interest

Of General Interest.

OMNOMITY BAM STRUCTURE—W PRANCE, Penacola, Ple Anong the principal where the principal structure is a second of the principal structure of the principal structure of metal formation with the immediaty of metal formation with the immediaty of metal present on the principal structure of metal present of the principal structure of the principal struct

BIRCTRIC FURNACE. II W HIXON billadelphia Pa More particularly this in ration relates to those furnaces used in the melting of zinc ares. An object is to provide vention relates to those furnaces used in the immediage faine over. An object is to provide a furnace in which the sinc is fed in at the top, which is kept closed by means of a top of double construction so arranged that an upper door may be opened and a charge fed in white the lower door is shut

### Hardware and Tools.

Hardware and Tools.

PADLOK F.-A. M. II is Barrecus, New York N. Y. Fals invention rister to lecks having a nain boil formed of how is unite, such, for instance as shown and described in the Letters Patent of the U. S. formesty provine a padlock having hoth sides of the hasp notched for engagement by the hooked morbits of a folial selection.

MAIL-HOLDING FOR STATEMENT OF BO CONTROLLS
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SHOW KARDORITE PAIR LECTURE SHOW ARRORMED PAIR TINOSETEN LAMPS —V B. INVAPE ROLL R. KIRINGARY, NEW YORK, WE TOR, N. Y. This invention is particularly useful in connection with electric image about the pair of the propose of the pair of the propose of the pair of the propose of the pair of the

### nachold Tullities

TRAP.-M. L. FRINCE, Onida, S. D. In this inner the investion relates to traps for use in abstracts, and recides more particu-

larly in a two our lies and the like, comprising spectrused acrosses singled to extract the insects, and so constructed as to permit of the
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such as the constructed as to pressive of the
such as the construction of the construction of the
WARLIDOARD.—D twax, New York, N Y
file improvement relates to make a wandboard,
in this board the investor forms the entire
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the channel is such that the corrupted sorial
tearnels remained formly held twenty.

MOP IFFAD — W II Zarany, Atlanta, Ola
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to pursuit the threads to day thus preventing
to an article of nonunderstary, the drive could
possibly be marketed without the handle

are provided for conveying air under presence it if it were, possible to require the theorem of the conveying air under presence it.

\*\*Rallways and Their Accessories\*\*
\*\*TRAINCHIMEN (1002012— A. W. Yeem, having means to relate the experiment of the photocraphic reverd could be greatly to the latter after of the third and the latter action of the latter after of the latter after of the latter action of the latter after of the latter action of the latter after of the latter action of the

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ould have fromble with the lights
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This ha very valuable book for all who are interested in any wip in shipping it gives a interested in the way in shipping it gives a six under each trea come a directory of man and attenues giving the long-like breadth, writer has found bits book of great value in ungaring tomase and horse pover in dis-puted questions which have aftern There are interested in the second of the second of the look of the look is printed on light whight pager rendering it very convenient for the contract of the look is printed on light whight pager rendering it very convenient for

reference. It is attractively beared
TITE HISTORY OF THE LORSHITTMIN SILDE
RELY AND ALLED INSTRUMENTS. BY
Florian Capical, Ph D. Now York
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The author is to be congratulated on the pro-tation of a submiss book. Avx. A., 1909.

This Kuntergarvon Ivan X., A., 1909.
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pied for upward of five years, is pro the first time in Ragilach Hierarcure's complete incored of the invertion and development of this working machine: In the 200 pages menty 500 machines are described with the aid of 200 illustrations—from the Mills Typérrière of 1,50 years ago to the adaptation of typerriting to the uses of wireless telegraphy. In this vol-ume the Breach typerritine, fivented by the late A K Beach, comes in for a proper share of attention.

INSECT WONDERLAND. By Constance M Foot New York John Lane Com-pany, 1910 Price, \$1 25 net

pany, 1910 Price, \$125 net.
The kind reception gives to the author's little book cutilited Nedware Through flurfers' comboids not the writer to choose for the subject of this volume some simple facts concerning the insert world, and she has selected one one specimens of such of the seven great or more specimens of such of the seven great orders of the function will according to the linear system of division.

THE CARP OF TREES IN LAWN, STREET AND PARK By B. E. Fernow New York Henry Holt & Co, 1910 292 pp Price, \$2 net

Figure 1601 & Co, 1910 392 pp.
The subtree may be well said to be the father of foresty in the United States, and these who have followed this are very decyly is said. The book belongs to the American National State of the American State of t

ing with helpful notes on their adaptations.

Divition Thinty of Any Maye Restrice By Thomas II Russell, M.E., Li.B. Children, and the Company, the Company, 1989 follow, 223 pp. Frice, Bi in cloth \$150 in leather libs is a countries of the Company, 1989 follow, 223 pp. Frice, Bi in cloth \$150 in leather libs is a countries of the Company, 1989 follow, 223 pp. Frice, Bit is cloth \$150 in leather libs is a countries of the Company of the C

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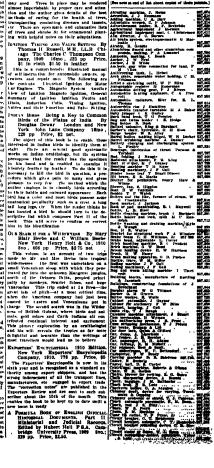
A Free Opinion is to the probable lifty of an investion will be readily give levester furnishing to with a model or sh a terior description of the device in game communication of the device in quite

MUNN & CB., 361 Breadway, New York Branch (Mos. 618 F St., beskington, S. C.

INDEX OF INVENTIONS For which Letters Petent of the United States were la

Bee note at end of list about copies of the

for the Week Ending May 10, 1910, AND BACK BRABING THAT DATE





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THE ACCIDENT TO THE "EXPERLIS."

(Concluded from page 416)
"Zeppelin IV" did not involve the loss of
any life The "Republique" catastrophe, On September 25th however, was tragic 1909, the craft dropped from a height of about 800 meters to the earth, and its passengers, Capt. Marchal, Lieut Chauve, and the mechanicians, Vincennot and Reau, were killed immediately The disaster was occasioned by the breaking of a propeller blade which flew off the heft

aft and pierced the gas bag The 'Zeppelin II," whose untimely en has been described, was taken over by the army last year, and made a member of the German airship fleet The vessel took part in last years airship maneu-vers at Cologne where it was stationed in the spring of 1809 the vessel made a long journey from Lake Constance to Bitterfeld and roturn remaining unin niversen and return remaining unit terruptedly in the air 38 hours, until it collided with a pear tree at Goeppingen, and was partially damaged. The Zep-pelin 11" had a volume of 15,000 cubic polls 11" had a volume of 16,000 cubic meters its length was 136 meters. Its meat must absolute the volctly was 12% meters as econd, or 28 miles an hour its a second, or 28 miles an hour its acryping especify, including passengers and supplies, was 8800 pounds it was provided with two cars. The two motors of the sirably developed each 115 Cherapower The total weight of the theoremover The total weight of the Orie-power The total weight of the Orie-power The total weight of the Orie-power Ches total weight and the Ches and meters, weighted 12,000 pounds The evertuen gas cells weighted about 2,000 nteen gas cells weighed about 2,500

re Control in the National For (Concluded from page 421)
way during the fire season, while the

work of clearing the strips in a satisfac-tory manner, including the disposition of all refuse, is to be done by the rail-roads but under the supervision of the Forest Service

One of the most potent reasons this agreement is a good one is the fact that the courts have decided the right of the Department of Agriculture to damages from roads running through National Forests for fires which they cause, and this fact is a strong inducement for the roads to join with the department the effort to keep fires down

Another strong factor is the fact that the Northern Pacific, being a land grand road, owns considerable timber on the al ternate sections along its line The Great Northern, although it is not a land-grant road, also has property at stake in its buildings and the line itself whose opera-tion may be seriously interfered with by

tion may be settled, and the relation of the value of heavy timber in mountain our regions as a deterrent to avalanches, landalides, and floods is also to be con-From the standpoint of far sighted business policy a still broader argument is the relations of the forests to the general welfare of the regions whose traffic the roads handle. Timber which goes up in smoke pays no freight tolls and unchecked forest devastation means the enfeeblement of many industries de endent on wood and water

Practical Sterilization by Wrans of Ultra-Violet Have. sems to be little doubt accord

ing to The Lancet, that the germicids action of the ultra-violet rays will shortly be made available for the purposes of ble for the purposes of practical sterilization in what exact tain, but one view is that they produce came Whatever the nature of the ac-tion may be, it seems clear that their these rays, and special precautions have application for the purpose of sterilizing to be taken so as to bring it thoroughly under their influence articles intended for human consumption articles istanded for human consumption under their induces will allimitate the objection to the use of chemical antiseptics, the effect of which space the human organizer may be harardia. In an interesting super which has reached us on the Bierlins is due to the shattering of the coal when then of Waker by Means of Quarts, it is experted from the favor of the work Lamps, by Dr Max was Recklinghamens, in just be blast The current of all the control of the control of

if is stated that work on a very large this subject, and has developed the entire system of sterilization of different liquids used for alimentary purposes liquids used for alimentary purposes, based on the effect of the ultra-violet rays created in Cooper Hewlitt lamps made from transparent quarts. The chief work in this line has been done by Prof Heart in the Physiological Jaboratory of the Borbonne together with Dr. André Helbronner, who cooperated with Dr Max von Recklinghausen a view to developing an entire steriliz ing system of the type described. The preliminary work was done by studying the action of the ultraviolet rays on different types of microbes and the influence of the different wave lengths. Dr Roux of the Institut Pasteur in which a good many of the experiments were made presented to the Académie des Sciences resented to the Academic des Sciences ome of the work done by the above cited cientists Technically speaking the sults so far have been the development scientists results so far have been the development of a small water sterilizer for hospital use whereby 132 gallons of sterile water are produced per hour from ordinary city water by means of one Cooper Hewitt lamp type Blikas," absorbing three amperes at 110 volts. Within a heat time a voye large straighten quitted. short time a very large sterilizing outfit based on somewhat similar ideas will be running which will sterlize 1500 cubic feet of water per hour, this being large enough to treat the entire water supply of a town of about 10 000 inhabit The installation of the lamp it stated, is a matter of no difficulty hat is necessary being to connect up to the terminals provided in the dome of the apparatus and to make the justment peressary for the voltage of the particular circuit In order that supply of water delivered from the apparatus may be absolutely sterile of sterile to any required degree it is not wary that there should be means dealing with the various water pressures met with in different districts. To secomplish this purpose the inict pipe is fitted with an adjustable valve of special pattern which can be readily set, so that when full open the delivery from the apparatus does not exceed the quantity specified this in the case of requirements being for absolutely sierile water, being 112 gaillous per hour. The water enters the chamber formed by the outer rone with a swirling motion. At the top of this cone it overflows and finds an outlet at the bottom of the inner cone up which it rises and flows out at the dis-charge pipe. The swirling motion is charge pipe. The swirling motion is maintained during the complete passage of the water through the apparatus in order that it may be thoroughly stirred up and all microbes presented to itso of the light the water coming under its influence on two distinct occusions. Draining cocks are provided on the apparatus to emble it to be thoroughly emptied should circumstances arise whereby it would not be used for a considerable time Not only does this sys ten provide in the case of the apparatus under discussion a continuous supply of sterile water available within five min-utes, but the water or any other liquid that may be treated is unaffected as far as taste is concerped as it retains all as taste is concerned as it retains all natural gases and sails in solution. The work of Prof. Henri, Dr. Helbronner and Dr. Recklinghausen has also been directed towards the complete steriliza tion of milk, and this they have also accomplished. The apparatus for this accompnished. The apparatus for this purpose is more difficult to build than that for the treatment of water. Water is very transparent to ultra-violet rays. milk however is practically opaque to

which passes through every coal mine from one ventilating shaft to another carries the dust into every part of the galieries, which may extend for several miles. The distribution of the coal dust is further increased by the conveyance of coal in the mine cars, which usually move in a direction opposite to that of the air current, so that much dust is blown from farm. The dust settles in the corner and on the projections of the walls of he gallery, and especially on the floor and the tops of the timbers. If the mixture of air and suspended

If the mixture of air and suspended coal dust comes into contact with a suf-ficiently hot flame a combustible gas is suddenly generated from the coal dust this gas, known as methans, or marsh Ihis gas, known as methane, or marsh-gas is not explosive, except when it is mired with air, in which condition it explodes with fearful violence. The shock of the explosion scatters in the air much of the coal dust which has actited on the floor and elsewhere, and the heat produced by the explosion dis-tile from this, want which coal dust a tils from this suspended coal dust a fils from this suspended coal dust a fresh quantity of methane which comes into contact with the flame. In this manner the explosion is propagated from point to point, often throughout the entire mine

extensive explosions of coal dust are confined to preventing the dust from rising in the air, and to disposing of the heat produced by the initial explosion effectually that the further distillation of the coal dust and the formation of gas are prevented. The heat produce by the initial explosion may be consum by the initial explosion may be consumed in the evaporation of incombustible liquids, distributed through the workings. The greater the quantity of such volatile liquid, and the greater the exlings The greater the quantity of such volatile liquid, and the greater the ex-tent of surface exposed to the wave of explosion, the more rapid and effectual is the absorption of heat. The liquid used for this purpose at present is water It is necessary to wet or sprinkle every part of the mine in which coal dust exists This precaution is enforced by law in Germany and Austria but not elsewhere even in England, America, or France Most of the water applied to vertical surfaces quickly runs off, and the little that remains adhering to the surface evaporates in a few hours. The effect persists a little longer on the floor of the gallery and other horizontal sufaces, but even the paste of coal dust and water that is formed on the floor and water that is formed on the floor soon becomes dry Hence the application of water must be frequently repeated Too frequent watering however, is injurious to the operation of the mine water soaks into the porous rock loosens it, causing danger of cav and In very hot mines, the rapid evap-tion of the water produces an exceedingly damp atmosphere, which very injurious to the efficiency and health of the miners The Krusko

The Kruskopf process for the prevention of coaldust explosions, which has recently been patented in Germany, em-ploys instead of water a viscous pasts, of such chemical constitution that it does not evaporate appreciably under the in fluence of the normal air current, but littenee of the hormal air current, but evaporates rapidly when exposed to the host of a small explosion. Owing to the adhesive character of the paste, it can be applied to all surfaces horizontal vertical and inclined and in about eight times the quantity which is possible in the case of water. The thick paste, fur thermore, does not soak into the rock and as it does not evaporate in ordinary conditions it does not increase the humildity of the atmosphere. It has been proved by experiment that a coal dust explosion which in its nature is proexplosion which in its nature is pro-gressive, can be arrested by applying this mixture to the first hundred yards of the gallery this distance being sum cient to cause the explosion to die out owing to lack of explosive material the actual conditions of mining the original ignition of coal dust takes place in almost every case, at the face of the (Concluded on page 429)



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Cassified Advertisements working, and the explosion is proposed. It is not to the control of the possible to confine the explosions to the workings themselves and to protect the rest of the mine, without the nocessity of applying the same precaution through miles of galleries. This fact greatly re-duces the expense and trouble involved in the method. Practical experiments in a Westphalian mine and in in a Westphalian mine and in an ex-perimental gallery have proved the cor-rectness of the theory upon which this process is based. In the mine, the walls runnined damp \$1,000 hours after the application of the paste, but they dried up within six hours whom water was used. The explosion of it grains of dynamics produced as an interior of coal-cient and air whom, he walls on the rail. dust and air when the walls of the gal lery are dry, and for this reason the us isry are dry, and for this reason the use of dynamite in coal minos is probabilited by law. The experiments prove that in a mine gallery protected by the Krus-kopf process, more than five ounces of dynamite can be exploded in a mixture of coal gas and air without causing ignition. The experiment was repeated twelve times. After each blast, the tweive times. After each blast, the quantity of coal dust in the mixture was increased by the addition of a fixed amount of dry dust, but the application of the paste or water was not renewed in these conditions, when water was

## curred after the twelfth blast when the Kruskopf paste was employed. These conditions are very much more unfa-vorable than those which occur in the Colors of Foods.

practical operation of coal mine

used, ignition took place after the third blast, but the first faint explosion oc

Of the strong addiction many consum-ers have for the use of foodstuffs that are secretly and highly colored for the market, the London Lancet says "For some not quite clear reason there are many people who look upon the brown egg as necessarily a new laid one, brown ogg as necessarily a now into one, and hence a fair demand for brown eggs has arisen, which is easily mot not by the honest brown egg, but by the white egg which has been steeped in a dye which renders it visually indistinguish which renders it visually indistinguish able from the real article Again, when milk happens to be of a buff tinge, it is milk of course nothing can be easier than to astisfy this preference for a milk of a course nothing can be easier than to astisfy this preference for a milk of a course of the milk of the milk better is disliked as looking too much like dripping. The remerly is simple, it is actually colored vegatables must be consumer of them being quite willthe consumers of them being quite will-ing to ignore the fact that copper does not make them fresh or wholesome On the other hand, curiously enough, bread

the other hand, curiously enough, bread must be white.

"It is, of course, perfectly natural to take color as a criterion of the dietetic value or flavor of food, and the attracvalue or navor or food, and the attrac-tive or unattractive appearance of food may make all the difference as to whether that food is, or is not, assimilated prop-erly The deceit which is practiced by artificially coloring food may thus serve at useful purpose, so long as the coloring matter is harmess, but as a rule the proceeding is an immoral one. It does not follow that because food is unat-tractive its value as a food is sit, while every form of sophistication is open to commercial abuse. A correspondent last week submitted to us a brown-shelled egg which on opening displayed a gor-geous red coloring scattered chiefly through the white On analysis The supply the shiften of a family is massive of the supply the shift of an analysis the largery fig. 1 and 1 an

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You want service at once. That is exactly what the Bell System endeavors to give you immediate attention, instantaneous service It strives to be always ready to receive your call at any point, and connect you with any other pointwithout postponement or delay.

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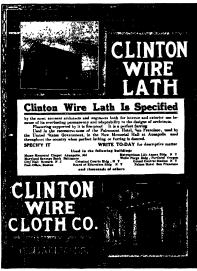


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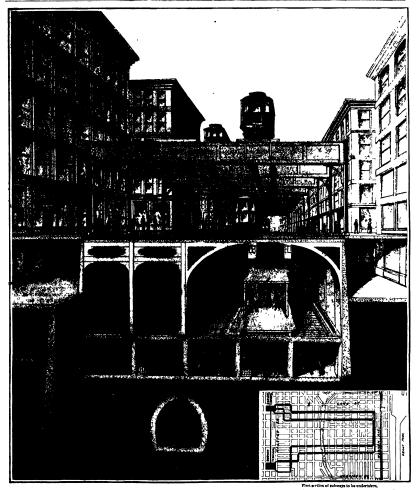






## A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. OIL. No. 28. | NEW YORK, MAY 28, 1910 | 10 (EVYN A COPY. Braining 98.)



surface and elevated, that enter the business more below street level. The above view shows a station on the new
The trelloy cars are to the right, the elevated express cars use the left-hand track. The lowest tunnel
to the propert flowing training and the state of the state of

## SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK SATURDAY WAY 28th, 1910 The Editor is always glad to receive for examination illustrates oricles no subjects of timely interest. If the photocrapies are sharp the armine should not the facts californic the contributions will receive special arterities. Accepted articles will be tend for at regular space rates

## OUR WATIOWAL GOOD ROADS LABORATORY

ONG the less known, but by no means less important, sections of the broad field of activ ity covered by the Department of Agriculture, is that which comes under the Office Hoads Although this office has no adminis trative duties and exercises no control over the re of the United Status - except of course, those that are located on government reservations—it is doing most important work of a scientific and ducational char

The movement for Federal assistance in the promotion of good roads dates hack to the year 1893, when a modest appropriation of \$10,000 was inche, to enable the Secretary of Agriculture to inaugurate the work To date a sum of nearly half a million dollars has been appropriated, and if this year's estimate be in-cluded the total reaches about six hundred thousand dollars

A full account of the growth of this moven presented on another page of this issue and it gi presented on another page of this issue and it gives us much pleasure to draw particular attention to that branch of the Office of Public Roads which is known as the Division of Tests. We make this special refer-ence on account of the high character of its organization and work, and because one of our recent editorials would give the impression that no such divi-sion exists. As a matter of fact this laboratory as infurmed by Director A W Page, is not only equipped with the last and most improved apparat quipped with the user and most improved apparatus used in Kuropean laboratories but has developed a number of additional tests, such as those for tough-ness and e-menting value. Houtine tests are made on road building materials free of charge for any citizen read unitining insterling tree of charge for any center of the United States and a large amount of experi-mental and research work is being carried on in-deed it is justifiable to state that the laboratory of the Office of Public Roads is the most completely equipped road material laboratory in the world and that the number of samples tested venry is far greater than in any similar institution. As a matter of fact, many summer institution. As a matter of fact, during the present year about three hundred typical samples of the rosed building rocks of England Scot land and Wales were tested by special request in addition to the regular routins work.

### ARBITRATION VERSUS SELF REDRESS.

S surely as the due! has given place, as individuals to the court of justice, will the awful arbitrament of war give way to the international tribunal, also as a corollary international tribunal, sisc as a corollary to this it may be written down that as the court of justice has back of it for the inforcement of its decrees the publish machiners of the government so will the international court be backed by some form of international police composed of limited mass sud military forces, in which each of the signstories to

the international court will be represented.

One of the brightest angurles of the dawn of a world wide peace is to be found in the fact that it has the fashion, during the past year or two, to speak of armies and navies as means for the preserva-tion of peace. When the leaders of the world, he they presidents kings or emperors, declars that every in crease in the armed strength of their respective cour tries is undertaken for the express purpose of preserving peace the statement is generally accepted as sincere. Although the advocates of peace by arbitration deplore the enormous investment of tressure time, and labor involved in the maintenance of the vast military organizations of the civilized world they are beginning to believe that the advocates of peace by war are as anxious as they thouselves that the world's neace he permanently preserved

The establishment of the noble principle of inter-national arbitration will be, after all, merely a repe-tition in the international world of a process of evolution from berbarism to civilisation, which has long ago taken place in the individual national world. Far back in the beginnings of human history, the princi-ple of self-redress was paramount. If wrong or fancied wrong was done, the injured party encompassed the death of his enemy by such ready means as might be at hand Gradually, with the growth of intelli-gence, it was realised, not only that the injured party was but a poor judge of his own cause, but that the principle of self-redross was subversive of the peace and happiness of the community. It was realized, also, that the man whose brain was clouded with the smoke of furious passion, was not so well quality judge as some third and disinterested party, who could junge as some totro and disinterested parry, who could look upon the case in dispute with an impartial eye, and so, gradually but surely, the principle of arbitra-tion took shape and became the stable rock on which iderful modern system of national jurispru dence has been erected
We have before us a lucid revi

the principle of national arbitration in a pamphlet published by the Maryland Poace Society and written by lames Brown Scott lecturer on international law in the George Washington and Johns Hopkins universities. He refers to the three stages which were shown in the development of the celebrated Roman judicial system which were as follows (1) The pri-vate illigant submitted his controversy to an arbiter of his own choice for decision according to the con science of a good and imparing man (2) the magis trate or judge chosen from an official list or par is preferred to a citizen arbitrator, (3) the admin tration of justice is regarded as the duty and there fore the right of the State and a judicial system is prepared for and imposed upon the citizen

The author of the paper sees the same unconscious

development taking place in the gradual growth development taking piace in one growns arbitration between states. In early times they would choose as arbitra the Pope, in modern times, some foreign sovereign. The lack of continuity of desome foreign sovereign. The lack of continuity of de-cision in this system, which desit with the individual case, led up to the second stage, during from the first conference, which involved the appointment by inter-national action of a ponel of judges, from which judges forming the temporary tribunal are cheese. "We stand," says the writer, "upon the very threshold of the third and final development when nations as a whole determine that international justice is the province of the international community and cousti-tute a court of international justice to which litigant states may resort in conflicts of importance ' much has been done. The organization, jurisdiction and procedure of this international tribunal have been determined Now, we mercily await the appointment of judges to establish a world wide court, in which the nations may obtain justice as easily and readily as private suitors in national courts of justice

The author of this paper does not go into the ques-on of the enforcement of the findings of international arbitration It is our belief that an international arourt should be backed by an army composed of drafts from the various armies of the world previous to their disarmanent limited in numbers and exist ing solely for the enforcement of its decrees

BIR WILLIAM BESSELS AND HIS WORK 7 TH the death of Sir William Huggins there passed away an astronomer whose pioneer work in the field of astro-physics pioner work in the nead of matro-physics the history of arience it was largely due to Sir Williams gentus that the spectroscope became an instrument of astronomical investigation hardly less important than the telescope. His work was done so many years ago, and its results have been so farreaching, that it is easy enough to value it at its true

Huggins began his studies shortly after Kirchoff applied the terrestrial science of spectrum analysis to the study of the sun Parity as a result of Huggins's efforts astronomers have been enable to obthe solar prominences at any time, with waiting for an eclipse, for the principle of spec waiting for an eclipse, for the spinciple of spectra-copic visibility of prominence lines at the edge of an uncellipsed aun was quite explicitly stated by him in February 1888 He even derived various instruments for bringing the prominences into actual view His use of the 'open allt' on February 18th, 1869, may be said to have begun the modern study of noise promi-mences. Helors the days of the 'open allt.' promi-nences had been examined only in sections.

The first investigation of more.

The first tangible results in the estimation of move The first taugible results in the estimation of move-ments of approach and receasion between the earth and the stars, by means of Doppier's principle, were communicated by Sir William Huggins to the Royal Society on April 23rd, 1888. Application of this method to the stars is encompassed with difficulties; for it needs a powerful dispersive spectroscope to show a minute line of displacement, and powerful dispersion involves a strictly properfiguate enter of light. Helecting the brightest star in the as the most premising subject of experiment, considered the F line in the spectrum of Stri just so much displaced toward the red as to indi-recession at the rate of 25 miles a second. The indias resumed by Huggins with improved app was resumed by Huggins with improved apparatus the following year, when the velocities of thirty a were approximately determined. The scope of William Huggins's achievement was not, however russem ruggmes achievement was not, however, detect the motion in the line of sight so much as retablish the method of precuring data. His sugh has been of incalculable value, so much so, that spectroscopic investigations of steller movements in confidently be expected to play a leading part is unraveling of the vast and complex relations of even now we dimly detect among the stars.

Mary all parts

even now we comput getest among the stars.

The first successful application of the spectra
to comets was made by Donati in 1864. Come
previously been considered to shine mainly, is
wholly, by reflected soulight. They were not
ceived to be self-luminous and to be formed, to a gowing gas. These represents to a small see nature of the sature of the gas, a problem first atty of sir William Huggins in 1888 Winnecke's conference of the sature of the sature of the sature of the sature of the first revealed the typical hydrocarbon specific with which we are now familiar Tebubtte close (context III, 1881) was the first context of which we have the sature of which Huggins was completely successful That achievement threw open to investigation a part of the cometary spectrum invisible to the eye, so as to allow

an additional test of cometary constitution
In the field of stellar spectroscopy Huggins s work by Lewis M Rutherfurd in New York gins may well be considered as one of the fathers of stellar spectroscopy. When he brought to a successful gins may wen or commercial as statements in spectroscopic culmination his early experiments in spectroscopic photography, we really began to learn something of romposition of the fixed stars On December 18 1879, he was able to communicate to the Royal So

ricity results answering to his expectations

The dry-plate process, with which such wonderful The dryphate process, with which such wonderly results have been obtained in astronomical photogra-phy, appears to have been first made available by Sie William Huggins in photographing the spectrum of Vegs in 1866. That work laid the foundation for the brilliant application of photography to astronomy by Common, Draper, Janusen Rutherfurd, and later

fronomers

A intrly complete preliminary answer to the ques-tion, 'What are the stars made of " was given by Sir William Huggins in 1864 By laboriously comparing stellar dark lines and the bright rays by terrestrial substances he sought to verify his conclusions regardless of cost in time and trouble Al-though he himself averred that the full investigation of s single star spectrum would be the work of years. be was able to furnish however detailed and ac mmte

drawings of the spectra of Betelgeux and Aldebaran Before Huggins applied the spectroscope to the study of nebulse, it was felt that these mysterious, filmy objects of light would forever thwart the astron cojects of light would lorsery tawart the automotive Each one and more powerful (elecacope that made its appearance had resolved into clusters stars which previously had appeared to the naked eye as single orbs it was felt that those filmy stars which had resisted all attempts at telescopic resolution might be similar clusters, for which reason some doubt was cast upon Herschel's theory that they were masses of shining fluid

pust 29th, 1864, Bir William Huggins sifted through his prisms the rays of a bright planetary nebule in Draco. To his infinite surprise, they proved to be of one color mainly and thereby proclaimed their Thus Herschel's conjecture liffused at large throughout the c gaseous nature Thus Herschel's conjecture of a "shining fluid 'diffused at large throughout the cosmos was unexpectedly revilled. By 1868 Huggias had sep-arately examined the spectra of about seventy nebula, of which one-third displayed gaseous characteristics. of which one-third displayed gaseous characteristics. All of these gave the green ray frudamental to be nebular spectrum and emanating from an unknown form of matter ansued by Raggista. "subnium." A successful beginning in subniar spectrography was made by fit william Ruggists of March 116, 138. Five lines in all stamped themselves upon a plate, exposed to the tary of the sebula in Orlon. The was photraphy definitely made the service of the readout.

nabulas
The effect of Huggina's work has been to remore that astronome; from the expedence of the telescope, to substitute for the retina the more sensitive photheristical point estimate the statement of the immensional plate, and to teach the astronome; the immensional plate value of the spectreeope in assistying the compension of attra which is the telescope appear is more point, or the property of the proper

A.C.A.C.M.A.C.TTCS.

Compared from the State of these Returns of Chacline Promone a fingures of chosel, 20 miles across counties state; was made in a biplane at a cistmed
agent of 4645 miles an hour.

Should Mines, a Belgish, New 2 hours and 51 min-this with a passenger in France on the 18th instant. This Hight was kied made in a biplane and constitutes

Aller, Clifford B. Elymon has been making some ex-usion; Hights of searly a half hours duration at Sancist, C. f., in the Parman highest which he per-sistent from Fastina. On the Stat he gain 4 the pilot-sighter (issues of the Asro Clab of America or making captured in the State of the Asro Clab of America or making algorites in the gas a valution, and it doding a great deal depretes to the gas a valution, and it doding a great deal

a. Moors, of Waskington, D. C., who has been Mr the Barliner's assistant for some time past, has con-stoted a very light monoplane, fitted with a 35-horses er revolving-cylinder motor. The machine and the complete weigh but 260 pounds. The motor places down and between the wings at the front of the machine. The cylinders revolve in a horimini plane, and drive the propelly through hevel
mers. Mr. Moore has gotten off the ground a nummer of times with his monoplane and made several

On May 18th, the day when the tail of Halley's o ted to sweep over the earth, Prof. A. Lawwas expected to sweep over the earth, Prof. A. Law-riace Rotch eart up a series of sounding ballooms down his Bive Hill Observatory These ballooms were equipped with assocrappals and with apparatus for edizating samples of the air at high stitteds. Prof. Rotch's observations were made simultaneously with those of thirty other experiment stations scattered glyrughout Europe. Soom sensibers of the U S devoloptical Survey also attempted to catch particles of conceary due at the Caregoic Observatory on Monte. Wilsen, California, by placing on a high tower a plate coated with glycerine Several balloon parties were coated with giverine Several balloon parties were organized throughout the country to view the comet when it was nearest to us.

e new monoplane that has flown so is that of Mr. Gardner Hubbard, which was built by Measrs. McCurdy and Baldwin at Baddeck, Canada Plants. McChray and Bridger at Bulletin, and the first and Anthonetic types. It has 280 square feet of supporting surface, the overall length being 34 feet and the spread the wings 20 feet 2 inches It weighs comple ut 1,000 pounds without the aviator, a 40-hore power, six-cylinder water-cooled motor of 320 pounds weight furnishing the motive power The propeller is driven by surrockets and chain, with a sear reduction driven by sprocesses and chain, with a gear reduction of three to five. On April 5th, nice flights were made above the ice on Lake Bras d'Or, by Mr. Kubbard, who had never Sown before. The monoplane reached an elevation of about ten feet, and flew several hundred

To a recent seronautic note we mentioned an sero plane flight of five minutes duration with four passen-gers. As a matter of fact M Roger Sommer took but three passengers with him on his record breaking flight of April 20th, Those were Mile Dutrieux (45 , 99 pounds) and MM Colombo (60 kile grammes, 132 pounds) and Frey (58 kilogrammes, 128 pounds) Sommer himself weighs 151 pounds. The total live load was 510 pounds, and the weight of the biplane please was 500 pounds, making a total weight of pounds that the 50-borse-power Geome motor of in 150 seconds. The weight off and of Bommer's machine is therefore 32 per The previous record of this kind was made by 77 Farman with a similar machine when he covered 10 kilometers in 10% minutes with two pas garn weighing 110 kilogrammes plus 30 kilogram of ballant.

On the 9th instant Messen. A. H. Perbes and J. C. Tauli mode an assessment an Quitter ID, in the former's spice hallows "Witting," one of the largest scale most up-witch acrossings than for constructed. The accounts of the second of the sec On the 9th instant Mesers. A. H. Ferbes and J C. 

### ELECTRICITY.

By ming a sectionsope and a sensitive telephone relay, the heart beams of a patient in London were transmitted to the home of John Milne, the noted sestemologist, on the Isla of Wight. The heart throbe were heard by four physicians over an ordinary telephone, and so clear, was the transmission that it was possible to diagnose the heart troubles It is expected that this use of the stethoscope with a telephone relay will enable physicians to keep in better touch with their patients.

An electrical thermometer which is very sensitive to slight fluctuations of temperature, has recently been put out by a German company for medical use, to determine the degrees of fever it consists of a to determine the degrees of fever it consists of a coil of platinum wire inclosed in a quartz glass tube. through which a current is passed from a four-voit storage battery The tube is placed in the armpit of the patient, and a milli voltmeter indicates varia or the patient, and a milit volumeter indicates varia-tions is, the resistance of the coil, due to the heat of the body. The milli-voltmeter traces a tempera-ture curve on a band of paper, and in this way it is possible to study the action of drugs on the patient.

According to a recent press report, steamships of the French trans-Atlantic line are using the apparthe press trans-atomic fine are using the appearatus invented by Signors Bellini and Tool of the Italian navy, by which wireless messages may be transmitted in and received from, any desired direction. The particular advantage of this appearatus on abphosoris is the fact that it enables the operator to determine from what direction a signal is coming. actermine from what direction a signal is coming, and the course of the vessel can be governed accordingly. Recently the "Provence" crossed the Atlantic, equipped with this apparatus, and was ab'e to determine the positions of various vessels passing in the vicinity. The danger of collision was thus entirely

An interesting paper on insulating materials for wireless talegraphy was read recently before a meeting of the Wireless institute in this city by Mr Stanley M. Hills. He pointed out that rubber is not perent, but apt to deteriorate, that marble is hydroscopic and not to be relied upon because of its irregu scople and not to be reliefd upon because of its irregu-lar composition, that percelain is age to contain hid den defects, and that glass, while the defects it con-tains may be descried visually and thus avoided, is extremely fregile. He spoke of mice and of wood as good insulators if kept dry, and dry of it as good insulator for the reason that it is liquid and "self-healing." Dry tim makes an excellent insulator, and for high voltages, compressed air may be used

The advantages of an electrical shovel over a steam shovel have recently been portrayed, showing that wherever electricity is available at moderate rates. waserver electricity is available at moderate rates, the electric shoved is much to be preferred One of the great objections to the steam shoved is the fact-that the expenses of a fireman must be paid, and the fuel, as well as the water, have frequently to be carted for a very long distance. Steam must be kent carros ror a very long distance. Steam must be kept up continuously, despite all delays in operating the shovel, while for the electric shovel the same argu-ments apply as are made in behalf of electric drivein machine shops, namely, that when the shovel is idle there is no consumption of power, yet the power is ready for instant use whenever it is needed

An interesting discussion by Dr Charles P Steinmets on the magnetic properties of materials was published in a recent number of the Electrical World published in a recent number of the Electrical World It was stated once years ago that magnetic alloys could be made by combining non-magnetic materials of Reinness points to the fact that is all the threat alloys manganees is used, and that this is slightly erro-magnetic One of the simplest of these alloys cobasts is combining one part of manganees with three parts of autimony, the miture being made by powdering the metals and than beating them in a text than. The result is a black power which is aroundy alloy has been found which does not contain some of the ferro-magnetic group—liven, cobalt, lockel, manganees, and chromitum the part of the companion of the

Now that air craft have been entered as war ves sels, inventors are beginning to cast about for some effective means of destroying them. Recently an effective means of destroying them. Recently as serial torpedo bas been invented, which, by means of a Heristan wave controlling system, may be directed from a distance without carrying any oper ator. This dospedo was exhibited at the London Hippodrone, where the inventor caused it to traval out over the audience, starting it wherever be chose by pressing buttons on a switchboard on the stage The torpedo is provided with two screws, which may be operated independently to steer the ship laterally. while a horizontal rudder serves to steer the vess white a horizontal rudder serves to stear the vessel vertically. The device may also be equipped with suppositives, to be dropped on the enemy when the beryselo has been maneuvered to the right position This, were formasserated at the Hippodrome by releasing fiftyers, on the audition.

### SCIENCE.

Beward B. Gerriott, chief forecaster of the United States Weather Bureau, died recently at Washington at the age of 57 He had been connected with the ther Bureau practically sinds its establishment, which means for forty years

After thirty months' cruising in Philippine waters, the Fish and Game Commissions steamer Alba rosa," Commander C M McCornick, United States Navy, entered the Golden Gate, San Francisco and dropped anchor The "Albatrosa" has been engaged in a thorough examination of the fish in Philippine

When one solid body gildes over the surface of an other, the coefficient of friction diminishes as the ve-locity increases and nearly vanishes when the velocity attains a certain critical value. This diminution of friction is due to the air which partially sepa rates the two bodies at low relative velocities em completely at the critical and all separates them higher velocities.

Dr Douglas Mawson, who accompanied Sir Ernest Shackleton on his last Antarctic expedition, arrived recently in this country, bound for Sydney New South Wales, to resume his duties as lecturer on geology in Sydney University Dr Mawson reiterated the state-ments already made by Sir Ernest Shackleton that there is an immense stream of coal within 300 miles from the South Pole

An interesting method for measuring the transpar ency of developed photographic plates has been de-vised by Dr L. H. Friedburg. A polarized light appa ratus is employed. An opeque plate not rotating the plane of polarization, when interposed between two parallel mounted tourmaline plates cut parallel to eir optical axes, will reduce the angle of 90 deg between extreme brightness and maximum darkness by an amount proportional to the density of the sil-

The emission spectra produced by certain elements heated in quartz tubes to 2 500 deg F have recently been studied. It is found that in these circumstances sulphur produces a blue light and a nearly ous spectrum Selenium gives a pale yellow light with bands, which are generally well defined, but be come uncortain toward the red end Tellurium emits green light and its spectrum contains nur ands which are also hazy toward the red end Phos phorus and arsenic give a white light and continuous spectra, while antimony produces a nearly continuous spectrum, crossed by very ill-defined bands

The distinguished German chemist Ostwald has taken out a German patent for the improvement of drawing inks and water colors. He has found that by addition of small quantities (from 1 1,000) of volatile organic compounds of the aliphatic series, which are soluble in water, at least to a small extent and contain not less than four atoms of carbon inks, drawing inks and other water colors a rendered capable of readily marking such surfaces as parchment lyory, waxed paper etc. In the case of neutral liquids, an alcohol, ester, or other neutral sub stance is used, while to acid inks, free fatty acids, such as valeric or caprok acid may be added

How bright is the sun? No two authorities agree Another estimate has recently been made by C Norce mann. The effective temperature determined with his pyrometer was found to be about 5 320 deg absolute Now, the brightness of an incandescent body emitting white light varies sensibly as a function of the tem-perature, and this law has been verified by compart son with numerous terrestrial light sources. Taking into ronsideration the absorption of the solar atmosphere, the effective temperature of the photosphere is probably about 6,450 deg absolute. The correspond ing brightness of the mean effective layer is then about 219 000 decimal candles per square contimeter The solar surface is thus considered to behave very a black body, and to have an emissive power nearly unity

Ducellies has made a study of the chemical char acter of various alloys of cobalt with tin, antibismuth, lead, and copper, by measuring the dif-ference of potential between each alloy and each of its constituents, when immersed in a solution of cobalt sulphate The results are expressed in graphical form. The curve of the cobalt-tin alloys shows a distinct inflection at the percentage of 66.76 of tin, which corresponds to the compound CoSn The cobaltantimony curve indicates the existence of two definite compounds, CoBb and CoBb. The cobalt bismuth al lovs also show two distinct compounds. The electro motive force produced by most of these alloys is very small. The curves show that in the separation of the two metals by the process of solution, the cobait results outlissed to practically pure condition, while the solution of bismuth contains about 5 per cent of coheir. The behavior of the coheir ded alloys is similar to that of the alloys of coheir and bismuth.

## THE LATEST GIANT FREIGHT ENGINE

## FOR USE, ON THE HEAVY GRADES OF THE DELAWARE & HUDSON RAILROAD.

Company to realize to what Brobdingnag ian propor tions the freight engine has grown The two men inside the 41 inch lowpres-sure cylinders one of them seated, the

seated, the stalwart me chank stand-ing erect in the 90 inch front end of the boiler with a foot and a half clearance be tween his head and the roof, tell their own story of di-mensions To this may be added the fol-

lowing particulars



A man can be comfortably scated in each of the 41-inch lew-pressure cylinders.

There are, as usual in the articu lowing particulars. There are, as usual in the articulated type, two engines on two trucks, the forward a low pressure with cylinders 41 inches dilameter by 24 inches stroke, the after engine a high pressure with

It takes but a glance at these photographs of the hugo Delaware & Hudeon freight entire executy bugo Delaware & Hudeon freight entire executy burned out from the shops of the American Levenoutter whell which carry the whole which which our glant and the product of the said of the control of the said of

tons of boal; its weight loaded is 168,-800 pounds, and the engine and tender the

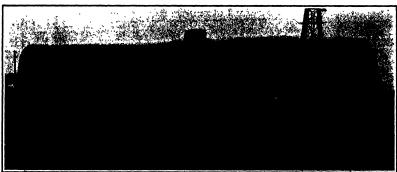
mean behind che code lead for the

has built six d these engines ware & Hudace Company.

Front end of holler is 71/4 feet diameter.

of the engine. The tractive power working compound is 105,000 pounds, and the calculated horse-power un der ordinary working is over 2,600 The huge boiler, 90 inches diameter at its smallest

They are designed for pusher service on the Wilkes-larre & Susquehanna division of that road, between Carbondale, Pa., and Oneonts, N Y—a distance of 95 (Concluded on page 449)



The bure belief is the secret of an American locametive's great power.



20 11. THE LATEST OF THE HUGE ARTICULATED PRINCET REGISSE.

## Eiffel's Recent Experiments on the Resistance of the Air

BY JACQUES BOYER

Bille's first experiments on the resistance of the air, a problem which is now engaging the attention of many selectuites because of its importance in aericantics, were made in 18974 at the amona Billet Towy, which was constructed for the Paris Exposition of 1898. The surface on which the pressure of the town, in connection with a chromographic asparatus, which recorded See resistance occased by the pix of the pressure of the

May of 1910.

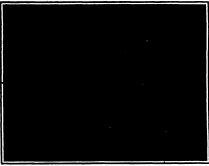
tion with a chronographic apparatus, but with a chronographic apparatus, but stated to the state of the state

nemes the record tables the form of Phys. Scholars of the Comment of the Section of the Section

The influence exerted by superposed surfaces of

such other is very great. In some cases the resinance is smaller for a group of surfaces than for a single surface. For surfaces inclined to the direction of the wind, SEES formulated in 1905 the following law vind, SEES formulated in 1905 the following law vind, seemed to the horizon varying between 0 and 10 degrees, the pressure is proportional to the andiyellow for isolinations greater than 30 degrees, the resistance is constant.

In order to extend these observations (which have



Pig. 8.—The Riffel accodynamic balance placed above the experiment room-

been fully described in the SCENTIFIC AUGUSTA'S Ellifconstructed in 100 an serodynamic laboratory at to constructed in 100 an serodynamic laboratory at to ducked experiments with fixed surfaces, expends to air currents produced by a blower of 50 kilowatic power. By this method be was able not only to obtain the resultant pressure, but to determine the distribution of pressures no both sides of the surfaces and the move-

of pressure on both sides or the surrace and the morement of the sir his twiching.

In order to place the surrace in conditions as nearly.

In order to place the surrace in conditions as nearly.

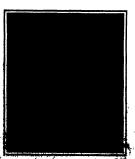
In order to place the surrace in conditions as nearly.

In order to place the surrace in conditions as nearly with order to the surrace in the content of the current must have so large a cross section that its eatering mines that the surrace in the surrace. The pressures experienced by the surrace measured by an aerodynamic balance, by which it is possible to determine the horizontal and vertical components, as well as the content of pressure, data which are very important in the construction of surrounds and extended to the red C, which is placed that the surrounds a link-in current. This rod is attached to a right T-shaped frame DB, which is expailed of motion around a kink-inge A. The action of the air current is opposed by popular the surround of the color of the air current is opposed by popular the surround a kink-inge A. The action of the air current is opposed by an upward poil at f produced by the weight P, in the balance above When equilibrium is established the moment of the forces which tend to move the experimental surface and its support round the knifte ofget, each to computed from the weight in the scale pass Two weightings are made, when the scale pass Two weightings are made, when the scale pass Two weightings are made, when the first reat reat and when it is in motion at known velocity. The moment produced by the air current is the difference of the two results. The other end of the

wo results. The other end of the rod E carries a second knife edge B, which is directed upward and which can be brought to bear against its seat by shortening the against its seat by shortening the of H, by means of the eccentric G. In this way the moment of the air pressure around B can be measured. Thus it is possible to measure the moments of the pressure. with respect to two points, further more, as the rod C can be rotated about its axis, the elements of the resultant pressure upon an inclined surface can be determined by mak ing four measurements, at asi muths differing by a right angle. The vertical part D is a rod of cast steel, which is capable of slight motion in a sheath attached to the floor of the room above, on which the balance stands. This sheath which is very narrow and is be a the vertical rod from the air our rent, without appreciably affecting is provided with a pair of knife edges at each ond The knife edges at the front or windward end 4 are directed downward and back ward, while those of the other end are directed upward and b

ward. The seats on three kaife edges have projections, which prevent the kuife edges from moving along the grooves in which they turn. By moving a lover, the life edges in frost each billited from their seats to protect the control of the life of the life edges. In the life edges in the life edges of the beaute, could be moved by means of kuife edges. In abort all the moving parts of the apparatus turn on kuife edges, and the friction is newlightly. The T-shaped piece 17th weight so moved the life edges and the friction is newlightly. The T-shaped piece 17th weight is not an entire and damping the secondary oscillations, due to mail variations in the force of the air currents and by making the equilibrium of the shr currents and by making the equilibrium of the balance stable in every relative position of the current and the surface. The entire apparatus is supported by a measure wooden patterns, about 8 feet again.

The current of air is drawn through a tube 64, feet in diameter, and every prevaulton is taken to keep its strength uniform during the experiment. The air is drawn from a large closed room in which the surface



Tige 6.- Regultinett room of Miller's nevelying

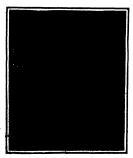


Fig. 7.—The inlet of the blower.

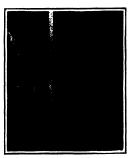


Fig. 8 —Arrangement of apparatus for measuring pressures at various points of the surface.

is placed near the inlet of the blower, and not at its outlet, as is usually done. The air which leaves a blower is subjected to irregular disturbances, which cannot be overcome sufficiently to produce uniform and constant velocity over the entire surface. The and constant velocity over the entire surface. The pressure secreted upon the surface is transmitted to the balance in the room above, where the observer is stationed. The sile renters the experiment room through a reliular disphragm in parallel filaments. At the opposite end of the room is the mouth of the conduit which leads to the blower and which contains two ironwhich leads to the blower and which contains two irou-wire grattings of 2/6 inch mesh, placed about 40 inches apart which almost completty eliminate all irregu-larities of flow The air leaves the blower through a conduit which gradually enlarges and serves still furconduit whith grantary states were the velocity and direction of the air current are uniform through out its whole section and, as the apparatus is entirely included, it is not affected by the wind outside

The velocities of the air current are deduced from the readings of manometers, and the results have been verified in the following manner One of the sur faces exposed to the current was perforated with a targe number of holes, in

each of which was countersonk a screw, having at its center an orifice 1/50 inch in diameter By measuring with a small manometer the pressure produced behind each of orifices, and integrating the result, the had been indicated by the balance was obtained

We cannot here relate in detail all the interest ing results which Eiffel and his assistant Léon Rith have already obtained in this laboratory We will mention only a few of the more important

Eiffel has proved that ne value of the horizon tal component, or resist ance to the advance of an aeropiane, increases con tinually with the inclina tion of the surface to the horizon, while the vertical ent attuins a maxi mum at an inclination of 15 degrees, and thereafter diminishes very rapidly, and vanishes at 90 degrees, i e , when the plane is ver

The surfaces employed in these experiments had a plane of symmetry paral lel to the wind. In order to determine the as of the air filaments in this plane, a short and very light wire, attached to the end of a thin rod, was placed at various points of the plane, and the position and direction of the wire were deter mined as accurately as mined as accurately as possible in most cases it was found that especially near the front edge of the surface the direction of the wire fluctuated rapidly

between two fixed limits This fluctuation in the direction of the wire is due to the fact that at any instant the air flows according to a definite, but not very stable, system so that only a very small influ very stants, system so that only a very small influ-ence is required to pass from one system to another. The various possible systems of flow could be approxi-mately determined by careful observation and com-

matery determined by careful observation and com-parison of the directions of the wire Fig. 3 shows the directions of the air 5.aments near a square surface, the plane of which makes an angle of 40 degrees with the direction of the current Fig. 4 shows the directions of the stream lines near a surface inclined 80 degrees to the current. It will be ob sace inclined so usgress to the current. It will so so-served that these lines are very variable and conse-quently very instable. The same fact is shown when the surface is perpendicular to the current. Fig. 5 shows the average direction of the air at various points in this case. In the two regions inclosed by points in this case in the two regions inclosed by the dotted lines, the disturbance is so great that no mean direction of flow could be determined In regard to the center of pressure, this coincides

with the center of figures if the surface is horisontal

to 15 degrees, and thesee receies as the instinction is increased, and again attains the center of figure when the surface becomes perpendicular to the extract Pinaity, Biffel indorses the almost universe preference of aviators for curved sustaining surface preservence or aviators for curved sustaining surfaced and proves that, for a given resistance to forward movement, the curved surface always develops a greater litting power than the plane surface, septi-cially at small inclinations.

### The Transit of Malley's Comet

The Transit of Malley's Counts in the expected immersion of the earth in the tall of that historic body have proven once more what may happen to the best-laid plans of mathematicians. The transit undoubtedly occurred, but whether or not the earth really encou occurred, but whether or not the earth result encountered the tail seems to be a matter of considerable doubt. When the night of May 18th came, and the aclenities world was all ago, the tail was an curred that the passage of the earth through it seemed only remotely possible On the morning of the 10th a bread hand of light that stretched along the horizon for a distance varying from 15 to 150 daynes profess of the control of the control

-11

FIG 3

FIG.4

FIG 5

E

FIG 9

was, affect the juriers lived ripodistine, which it is almo-leaves that theory supposed.

haves that the property of the

The expedition which was sent to the Hawaita The expedition which was sent to the massing, liands by the Astrocomical and Astrophysikal Society of America for the purpose of observing the transfercables a preliminary report of complete finality is note any transit whatever. This was more or less separated in 1883 a transit occurred which was fortunately

observed by Mr Finlag at the Capo of Good Hops The comet of 1882 was followed by him "continu-ously right into the boll-ing of the limb," No soonor the himb." No soes-or had it touched it, than it vanished as if de-stroyed So sudden was the disappearance that the comet was at first belleved to have passed be-hind the sun. As a mat-ter of fart, the observers at the Cape had witnessed a genuine transit The experience of the observers at the Hawaiian Isi ands with Halley's comet seems to have been exactly similar On the whole this apparent failure to observe the creeping of a black speck across the face of the sun may be deemedaronfirmation of our present theories that the bulk of a comet is much too filmsy to be detected in the blinding glare of our central luminary

Although the passage of earth through the tail of Halley's comet turned cut to be an extraordin ary disappointment, it is unfair to charge mathematical astronome with incompetence A comet's tall to so capriclous, so fluctuating a structure, it changes with such startling rapidity, that the predictions of any astronomer with regard to its behavior must al-

The tail of Halley's comet has conducted itself in a most whimsical fashion In the middle of February, it was some fif teen million miles long In April, it seemed have vanished entirely.

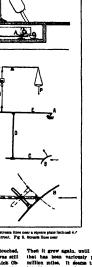


Fig. 1 The Krifel servelynamic balance, Fig. 2, Diagram of the tetance, Fig. 2, Direction of stream lines no to the air current Fig. 4. Stream lines near a square plate inclined 8 \* to the air current. Fig. 5.

claimed indubitably that the earth was still untouched, claimed indubitably that the earth was still untouched, and that contrary to expectations, the comet was still in the east. Prof W W Campbell, of the Lide Co According to him, the tail was at least 160 degrees long and larged far behind the radius vector. Because of the angle of 18-old degrees which separates the sertit's orbit from that of the comet, the convention of the tail, to which this attractionary missedwitzers of the tail to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail, to which this attraction rate rate of the tail to which this attraction rate rate of the tail to the comet, the carried rate of the tail to the comet, the carried rate of the tail to the comet. may probably be traced, probably prevented the earth from coming in contact with it.

from coming in contact with it. All the scientific aspectitions which have been sent out to various parts of the earth will probably come back with nothing to report. Some of these scientification parties must have proceeded to their destinations at considerable scapese. Thus Pro-Bilticland, in the nontherin part of Norway, for the purpose of the probably contributed to the contribute of the purpose of the purpose of the purpose of the activities of the contributed to the contributed that they may, in some

In April, it seemed to Then It prove again, until finally it attained a length that has less variously placed at viewing to hydrogen that has less variously placed at viewing to hydrogen that has less variously placed at viewing to hydrogen that there were no less will defined parts. When we late three more or less will defined parts. When we consider that knowhoules's closely of 1969 (comest 0, 1969) exhibited more extraordinary changes; that it preparetally formed tidal, which were glittened to drift out bodity into spees, whill they finally upshed, away; that in several cases and large out in a flower or less that in several cases and the several considerable and it that had gone out in a flower or less that it is a several cases of the several considerable and that are more visible at common distance from the molecus that, several tissue, the master of the tall went securious visible at some distance of the tall was accolorated, periodification of the several property and the several property and the several property of the several property o

## Korrsepondence.

### PRANCETTO ARROPLANT ELIGHTS.

or of the SCHENTIFIC AMERICAN

initiat to your communication of recent data. repositing me to forward a drawing of an apparatus raids some French journal has stated I have for ascontaining the height of an aeroplane in flight, I beg

Sears to say test corre in some insocursor in con-siphenests as quoted.

Primarily, the apparatus used were merely a rough-friends "mange bake," such as has been in use for since time in the Const Arillery Corps for computing the "owers and shorts" that occur during their hige. Secondarily, in so far as accuracy is Bun praci rned, it cannot by any imagining be considered as a triangulation n method employing two

procures as a transplanton method employing two femalits with a long connecting base lina. "The "range rake" is simply a wand shout three special in langth, having at one and a set of fine new-testh placed at right angles to the wand on a metal sirple several inches in longth Measurements are taken between teeth to the right and left of the mid-

The principle on which this depends is that of simi-The principle or when this openes is that or similar triangles, the same being illustrated by the accompanying diagram. From this diagram and description it can readily be seen that the short base line precludes any great accuracy in the computations. However, to apply the facts to the particular flight



MEASURING ALTITUDE OF ARROPLANE WITH A BANGE BARR. BO: AD: | of | Ax| of width of asympton measured on the rake.

which was referred to in the French journal, I am

which was referred to in the French journal, I am of opinion, personally, that Faulhan actually attained an elevation of approximately forty-six hundred feet, for the following reasons.

1 The official figures were taken by two transits

one thousand feet spart. The solution of the ob set one thousand feet apart. The solution or the op-tained triangles gave him an altitude of 4.165 feet. The method and computations of the triangles were undoubtedly correct. The error, if any, was due to the fact that he attained his maximum height when crossing the line joining the transits. This so appeared to me At that time, owing to the acutenes of the angle of elevation, it was impossible for either transit to take a reading, both being interfered with borisontal bases of the instruments. mum beight as taken by these transits was when Paul was distant from the base line approximate

3 Pauthan had with him an aneroid barometer corrected but not sealed. He stated that this regis tered a maximum of 4,500 feet (after being reduce

Blvo a season of the maximum height as taken by Capt Samuel Settoms, Coast Artilliery Corps, U S A., and myself with a range rake, was 5,387 feet.
From all of the above 1 am of the opinion given above, viz., that Louis Faulhas actually attained a sub-side of seno-commentary four thousand six hundred abore, vite, 'their Louis Paulhan actually attained a highly of apprecipinately from thomans six hundred ford at the Los Angeles meet, but am also of opinion their the official figures of (130 feet, cross the only one which could have been accepted under the circum-stances, Lorentziaka diguate Corpe, Balton States Army, Projection of San Frenciscon, Dalton States Army, Projection of San Frenciscon,

Proof of the Protection, Ch.

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## Scientific American

NOW CRICAGO IS SOLVING ITS NAPID TRANSFET AT D. H. OTHER

The city of Chicago has been hard at work rehabilitating its surface street-for ayatens, and completing
plans for the new subway lines. The engineers of the
city have cetimated how many passengers cuter and
leave Chicago's six square miles of business area
swary twenty-four hours, and the results prove that
he present lines are hopelessly overworked During
two normal business days of the past year it was found
that on all of the lines running into the down town
district bounded by Chicago Avenue on the north,
by Tweiths Street on the south, of the betty Plaisurface of the control of the control of the control
area of about at aquare miles, avery asventh passenger was without a seat. When it is remembered that
the service cannot be improved much along present
lines, it is clearly seen that a subway is importantly
At a conservative estimate, the next generation will
see a demand for train facilities from the central ditrict of the city qual to all facilities now available
from the central part of New Tork city, with all it from the central part of New York city, with all its ferries, tunnels, subways, bridge and surface lines. To most this need the engineers have planned a sysh it is believed will adequately meet this

great demand for cars during the rush hours

The complete-system will be bounded on the north by Chicago Avenue, on the south by Twenty-second Street, on the west by Halsted Street, and on the east by Wa-bash Avenue Four terminal stations will be built imcountries of this subway sone, one at Chicago Avenue and North Franklin Street, one at Dearborn and Twenty-second Streets, another at Van Buren and Haisted Streets, and the fourth at Van Buren and rassicu perseus, and the south as Randolph and Halsted Streets. The new underground will begin where the four clevated lines now enter the district, and all surface cars from the respective quardistrict, and all surface cars from the respective quar-ters of the city will also converge at these four termi-nal stations, where all surface and elevated cars from the resident districts will become subway cars, and will remain under the surface until they again pass out of the district.

shown in the front page plan, a four-track route As shown in the front page plan, a four-track route will run close to the surface of Wabsh Avenue from Chicago Avenue to Twenty-second Street This route will carry all through cars from the South and North Sides, two tracks being exclusively for surface cars

Sides, two tracks being exclusively for surface cars and two for elevated trains. After passing to the opposite limit of the district, the trains from each direction will turn about and will return to their respective starting points by the same route From the West Side of the city two tubes will run in beneath Randolph and Washington Streets as shown in the accompaning plan, and will turn southward on State Street, and then return to the West Side under Adams Streets and Jackson Dioulevard After coming out into daylight at the Haisted Street terminal, these cars will also scatter to ail points on e west side of the river

To complete this first stage of plan one will cost To complete this new stage or plan one will coar-about forty millions of dollars. Its capacity will be fifty per cent greater than that of all the traction lines now operating within the district. With the aid of surface cars to make short hauls within the s district, this plan will serve the needs of the city for many years.

An additional expenditure of forty millions will An additional expenditure of forty millions will then build the second stage of this plan, when other busy streets will cover branches of the system. In this stage of the development will be found both loops and through routes for all parts of Chicago Yet where the various tunnels cross one another there will be no grade crossings one tube will dip in its course so as to pass completely under the other line. This will eliminate all danger of underground colli-

stons.

A further expenditure of thirty-two million dollars will serve to complete the system, when every street within the subway some will have beened it a proposed to subway. Two, three, and four-freck subway lines will homeoun the whole area, and the entire district will be served by the most substrate, set the plan, in its completed form, will cost about one hundred and twalve millions of dollars, and will serve he needs of the city at its present rate of growth until 1950 Improved methods of transportation will mobably cause the business district to expand, and until 1980 Improved methods or transportation will probably cause the bestness district to expand, and the subway will be built socordingly. It may ulti-mately be possible to remove every pract of rail and every car from the surface of down-fown streets. On our frunt page is shown a cross-section of one of the future stations on Wahash Avenue. As seen in this nation, the force of the force to the cross to the this nation.

or the future stations on Wahash Avenue. As seen it this potent, the tracks it close to the street surface because or the danger to certain building foundations, a lewiered subvey is impracticable, and the contestion by prohibitive. As the entire subvey is to lies for the contestion of the prohibitive as the entire subvey is to lies for the contestion of the contestion

and the engineers have worked out a type of con-struction to meet this requirement Stations of this type will be built in the center of every block on Wahash Avenne, and the platforms will be but a hort distance below the sidewalk level Underground walks will afford opportunity to cross the streets, or

walts will amore opportunity to cross the streets, or to walk parallel to the car line, past the basement windows of the department stores

The cars will include the most modern improvements, such as side entrances, to permit the rapid handling of passengers, provided with automatic signals, to the contract of the co handling of passengers, provided with automatic sig-mals to show the moloruzan when all the doors are closed. The use of these cars will greatly reduce the length of stops at stations. The plans also provide for the housing of all underground willities in suit-side chambers are street public service corporation will have its own chamber, as shown on the front-pass engraving, in which will be accommodated all of its pipe lines within the authway none "Particular care," when the provided in the commodate of the pipe lines within the authway none "Particular care," when the provided in the commodate of the pipe lines within the authway none "Particular care," very vital provision in the consideration of the fu are needs of the business district. These chambers will be easily accessible from the street surface, so that it will be a simple matter-to inspect or repair the pine lines of any company. The cost of this gal-lery construction has been included in the foregoing figures, so that an expenditure of one hundred and twelve millions of dollars will give Chicago a com-plete traction system, and the best possible provision for her public utilities.

This comprehensive plan is the outcome of seve months of investigation by City Engineer John Ericson The result is a scheme of construction that is well adapted to meet the peculiar needs of a city well adapted to meet the peculiar needs or a city that has its entire bushess interest within an area of six square miles. Whatever slight variations may be made in the plans during the progress of con-struction the scheme for construction as here de-scribed will be the general foundation for whatever subways may be built

The (urrent Expelement.

The turrent implement.

The Garratt facible railroad locomotive is the subject of the opening article of the current Surrayatvn, to 1795. The salient features of the locomotive are its extreme fiesibility and adaptability for operation on steep grades and sharp curves. The mining of tungstom one is described by Consular Agent Harry A. McReide of Blibba. From the heartning America. tingsten over in descriptor by consumer agent many ac-McBride, of Bilboo. From the beginning, American agriculture has been characterized by its extensive-ness rather than its intensiveness Land has been smore abundant than labor Frof Homer C Price contributes an article entitled. The Reorganization of controlles an article entitled in recognization of American Farming in which he points out that the problem which now confronts the American farmer is to adapt his soil to present conditions. William E Stark presents the first installment of a paper on "Measuring Instruments of Long Ago" "llo, a Third Universal Language," is the title of an article describ-ing a universal tongue which is intended to take the ing a universal longue which is intunced to taxo toe place of Seperanto, on which it is an improvement. Prof Ralph Barton Perry writes on the prophecy of Francis Bacon. A profile puppet-show can be made as described by A Rose. Some new electrical and physical apparatus are illustrated Prof E A Min-chen reviews some applications of microscopy to prac-tical science and modern knowledge

## The Difference Setween a Sanitarium and a

The words "sanitarium" and "sanatorium" are popularly understood to have the same meaning and are generally used interchangeably, when designating (or describing) places of refuge for sick people but there is, in fact, quits a distinction between the meaning of

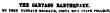
the two words. In answer to a correspondent on this subject the Literary Digas says
"The distinction between these words lies in the fact that they are derived from two different Latin roots. 'Sanatorium' is derived from the late Latin roots. Sanatorium' is derived from the late Latin sensaforius. meaning health giving The 'erm relates specially to 'an institution for treatment of disease or our of invalida, especially an establishment employing natural therapeutic agents or conditions peculiar to the locality, or some specific treatment, or treating particular diseases' On the other hand, 'annitarium' is derived from the Latin sensing from sensus meaning abole' or sound 'Sanitarium' relates more specifications. ly to 'a place where the hygienic conditions servative of health, as distinguished from one wi cally to 'a pla conditions are preservative of neatin, as dustinguished from one where therapeutic agencies are employed. Hence it is tis province of a 'sanitarium' to preserve health, that of a 'ananatorium' to restore it. Care should be exercised in combining the proper vowels in these two words in order to indicate correctly the derivation"

In our issue of May 14th we published an article on the utilization of wireless telegraphy in connec-tion with a Chalmers-Detroit automobile in the Glid den tour Through inadvertence, we neglected to state in the article that the wireless installation was devised by Dr Lee De Forest.

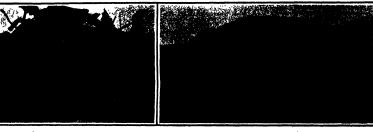
seconds The destructive motion was mainly vertical and began suddenly, that is, without the premonitory shorks which usually give most people time enough to run out from their houses. Immediately after the beavy up-and-down motion came a long series of smaller

ocks, among which a gyratery meeting was perception.

The dust reliable by the histoatenesses full of successing public besideling was no graid that talking only thought they had exceed death by crushing by the day of selfontion. Twenty thousand members,

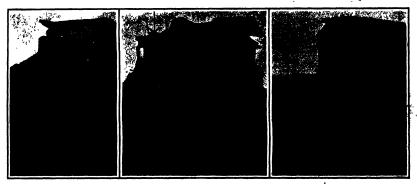


On May 4th, at 6 5 P M, the city of Cartago, former capital of Costa Rica was wiped out of existence by an explosive earthquake which lasted but a few



A corner of the Palacie de la Paz

Ri Palacie de la Paz (Palace of Pence) gift of Carnegie, just completed.



A primary school.

House of Poet Trope, who was killed on the sidewa

Bear view of the wrecked convent



Front fagade of the convent. Note the absolute wreaking of the massive

Top of church tower bodily form domader and farming as

are left without shelter. As the writer is sending this relation (May 7th) 700 corpose have been dug out of the rylins, That number is rapidly increasing The number of no tyet known. They are curried daily, by special trains, to San José The description of the control of the

titution and suffering are intense. Persons who wish to help may do so through the American legation in During the year 1909 small earthquakes in Cartago

During the year 1909 small earthquakes in Carago had been rather frequent, and the writer, who as seismograph in the Cartago College, began to send regular reports to the recently founded Strasburg Control Bureau of the International Association of Setsembers of the Property of the Property of the Sets of became alarmed, and spected in the streets and public parks tants and sheds, in which they stept. The

### NOW TO ACT IN CASE OF FIRE.

ST PERFORMANCE.

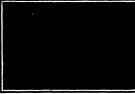
Perhaps no single ejaculation is capable of producing so instantaneous and so widespread an alarm as the cry of "Pire!" Nor is this surprising whon we remember that the fire fend is each year responsible for an almost incalculable loss, both of life and of

Yet of all emergencies, none more than an outbreak of fire imperatively demands a preservation of one's power to act with coolness and decision Often, by prompt and well-directed action, the threatened catas trophs may be averted, the loss of property and what is still more important, the loss of human life, may

Fire drill nowadays has its place in the routine of every well-conducted scholastic establishment, nor can it be doubted that the capacity for prompt and intelligent sction thus inculcated in the minds of intelligent action thus incurated in the raises of young people of both sexes has, ig emergency, proved the means of preventing squalling disaster. But while this capacity for combined action is very desirable, there seems to be a danger of fostering it at the expense of what one may term "fire aducation' Every child should be taught by means of precept tor's head, but the carbonic-acid gas with which the ater is charged belps to deaden the flames. How to act for one's safety, or to assist another,

in the case of burning clothing cannot be better told than in the words of Prof John Marshall He says "If the dress of a woman catches fire, she should at once lie down on the floor, and should crawl in this position either to a bell pull or a duor, and call for assistance, or she should roll herself in a rug or blanket in the event of a man rendering help he should at once lay the patient down take off his and roll her in it, unless he can obtain a blanket or rug or roll her on the carpet If a woman ronders assistance, she must be careful not to allow her own clothing to touch the victim, but to hold a rug or bianket in front of herself while approaching the fiames."

Prompt action without rashness or self-balking hurry, is the keynote of success in fighting the fire-field. This applies especially to those who wake from nend into applies especially to those who wast from sleep to find the house on fire. Not a moment should be lost, but there should be no wild rushing from a window to a door and back again. First an attempt should be made to get down the stairs. To excape through passages filled with suffecating smoke, tie a



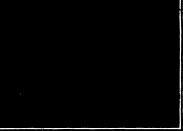


Binging oil from overturned lamp extinguished by

To avoid drawing burnt or sealed limb from clothing out apparel away with sharp scienors.

Manner of tying sheets, etc., together to form an escape rope









Crawling method of escape from passages filled with smoke. Handkerchief helds wet sponge in place.

A syphon makes a handy and an efficient fire extinguisher. NOW TO ACT IN CASE OF FIRE.

Method of using knotted blanket or sheet rope for escape by windows.

shocks had nomewhat decreased in number and in-tensity when the fatal insue came. Cartago is situated at an altitude of 4,700 feet, at

the very foot of the huge volcane Iraru, which towers 11,500 feet above sea level. The Iraru volcane is considered as extinct, the only remnant of its former activity being a few famorolies or steam jets, located at a considerable distance from the new silent and cold craters. At no time before or after the catastroph have the frimarolles shown any symptom of increased activity Moreover, the seismograph in Cartago gave for most earthquakes a direction which was almost perpendicular to that of the volume. However, a few days betwee the destructive shock, the direction of the certification because variable, and for some of them coincided with that of the Franc. On May 4th the connoted with time or the frame. On May 481 the meetle of the apparatus logar writing the last chap-ter of the frame, and while so doing jumped out ser-ored times from the glass plate. Then the seismo-graph, which is a neary invaried peakelvien contained in a box some three feet high, was violently thrown against the wall; the given plate bill from its abelf,

ngazont and was; the gram pease full from its shelf, and was broken in two.

Among the public buildings which are in rules in the beautiful Palace of Fence, a gift of Mr Andréw Chrisquie The paints had but been completed, the inferious and, being loft unfaithful.

and experiment, what to do when a fire breaks out in his own house He should be instructed how to go to work coolly and methodically either to extinguish or—if necessary—to escape from the build one of this kind, imparted by practical meth thg Less ods, would become a source of strength in after life and would go far to chock the recurrence of fire out

breaks, with their entailed loss of life and capital Take, for example, the case of an overturned lump There is a sudden and alarming blaze, but if action is taken at once, the damage may be confined action is taken at once, the damage may be confined to the extree, legible or what not upon which the lamp actually like. To throw water on the confineration is useless. This burning oil will eithly be forced or a larger area. The aim should be to absorb the oil and mother the fames as much as possible, and this may best be done by means of some non-fammable preference as four, sand, earth from the garden

r snything of the kind Another point worth rem ing is the use of sode-water sypbon as an extinguisher Suppose that a lump or candle has ignited a curtain and that the finish has run up the fabric. A syphon of soda water held as abown in the accompanying photograph, and assisted over the famos, will work wonders. Not outs does the force with which the liquid leaves the table allow of its being directed well above the operawet handkerchief over the mouth and nose then crawl on the hands and knees, for the smoke tends to ri-with the hot air and will be less dense close to the

But if the whole of the lower part of the house is burning and cs spe by means of the stairs is impossible preparations must be made for leaving through the window. The all the sheets and blankers together the window. To all the sheets and blankers sign to by means of reck hosts which all in or all p no mai ter hos much strain is put upon them. Then drop the bedding or mattress from the sindow in order that there may be some kind of break in the event of a possible fall. Finally make one end of your im provised fire-exame fast to the bedpost drop the other end from the window, and after making sure that it reaches to or almost to, the ground go down it boldly hand over hand. It should be added that in the case of inexperienced persons there is always considerable risk of a dangerous fall resulting from this means of exit, therefore it should be undertaken only when all

other means of escape have falled

In conclusion a few words may be added respect
ing the treatment of burns and scales prior to the
arrival of a doctor. The main point to bear in mind
is that the air is to be excluded from the affected part as quickly as nossible This ma (Concluded on page 451) This may be done by

# THE HEAVENS IN JUNE

### BY HENRY NORRIS RUSSELL, PHD.

UNE, though less exciting from an as-tronomical standpoint than May, is still a month of more than usual in-

terest Halley's comet will, of course, still be the main object of attention. At the beginning of the month it is ex cellently placed for observation, about midway between Regulus and Alphard (a Hydrae) on a dark sky, setting after 11 P M it will how-

acting arter 11 P M It will how-ever be much less completious than the week before, and will seem to shrink and fade rapidly as it recedes from us. Its distance on the ist is about fifty million miles, and this increases steadily, at the rate of three and omehalf million miles a day—to which the earth's and one-half million miles a day—to which the earth's motion in one direction contributes about one and one-half million miles, and the comet's motion in the opposite direction the remainder its apparent motion in the sky is slow, for it is

moving simust directly away from us travely contword and stars, continuing the line of its carlier path but very much more slowly, covering only 13 deg dur-ing June, and 5 deg during July

During the first ten days of the month it will still be a fine naked-eye object. Then the new moon will begin to flood the evening sky with light, and drown say with fight, and drown it out. By the time she is out of the way again the comet will be 125 mil-lion miles from us, and equally far from the sun, that little can be seen of it without a field glass.
With the aid of the latter
it can probably be folloved all through the

The display which this comet has given us dur ing May is probably the finest of the last fifty TORTE

Curiously enough, its only rival in the last quar ter-century is the great comet which appeared so unexpectedly last January This was at one time much brighter than Halley's comet (owing to its close approach to the sun) but its tail was not so long and it was too deep in the evening twilight to be seen to the best advantage

Daniels comet of 1907, though intrinsically of about the same magnitude an Halley's conet, was never within fifty million

a spectacle

miles of the carth, and so never afforded nearly as fine

a spectacie

Back of this is a long barron interval. The last
previous comet which was at all complexeous to the
naked-eye was the great one of 1882. This was one of the grandest on record, and had a tall over 100 million miles in length but this was directed almost nvillon miles in length out this was directed among away from the earth, so that it never looked more than 35 deg long—as against over 80 deg for Halley's comet before it left the morning sky Before this than 35 deg long—an azainat over 80 deg for Halley's comet before it left the morring any Before comet before it left the morring any Before it is comen torgatis's comet of 1874, with a tail of 50 deg long but the last comet, fully comparable in appearance with our visitor of this year, is the great comet of 1881, whose tail was at one time present comet of 1881, whose tail was at one time present comet of 1881, whose tail was not extend the earth passed through the tail without appearance the earth passed through the tail without appearance decks to their than a general illumination of the sky on the night of passage. Three years earlier, in 1889, aneagard Donesit's comet by common consent the fishest appeared Donati's come! by common consent the finest of the last half of the nineteenth century

Several of these comets, especially that of 1882, were really much larger affairs than Halley's, but were really much larger mains than Halleys, but the very favorable circumstances of the present re-turn make it comparable, as a spectalle, with any of them, so far as can be judged from the records 'The last news at the moment of writing is that its

head proved perfectly transparent during its transit across the sun, and that its tail is so much curved in its own plane that the earth did not reach it till in its own plane that the earth did not reach it till long after daybreak on the 1916. Before dearn this morning it was a magnificent object, extending from the eastern horizon half way acrose the sky, till it was lost in the Mikhy Way Its total length up to the invisible hand was fully 120 deg, according to observations here, and 190 deg as seen at the Licht Observatory a few hours later.

OCCUPATION AND THE HEAVERS
As our marvalous visitor fides in the western heavens, we may turn once more to the old familiar constellations. In the north, below the Pole, in Casable, low on the horizon Above her is Cephens, and higher still the Little Bear, standing poised on its tail above the Pole. Beatment this and the Green Visits. higher still the Little Bear, standing poised on its tail above the Pole Between this and the Great Bear are the long coils of Draco Our initial abows the truly formidable aspect of this monster, whose form, coils and all, can be traced with decided likeness among the

the Crow and Oup resting upon his book, Sine sent far down below Virgo, are many of the stars of M Centarr and the Well. Chescreen in low latitude many the tropics, can see below these the two brids out stars of the possessiation which, though among the most brilliant in the heavens, have no Greek or Arabic names, being too far south to be to the ancients. The easternmost of the two sternment of the two, Aip Centauri, is known to all students of as our nearest neighbor in the heavens—only away as Sirius, which, so far as is now hi only half se

Farther cest, and best seen a little earlier in the evening, is the Southern Cross.

Leo, in the west, and Cancer and Cemini below complete our list. This region of the sky will be the closest watched of all during the month, for the commit is there.

THE PLANES

Mercury is morning star all thro

balne about the time of about the time of his greatest elongation on the 18th, but as he is than south of the sun, and rises little more than an hour before him, the pres-ent apportunity is unfa-

Venus is likewise morning star, rising be-fore 3 A M and very cou-

in Gemini and Cancer, setting more than two hours later than the sun. Jupiter is in Virgo, visible all the evening. He is in quadrature on the 27th, and comes to

the meridien at 6 P M
Saturn is morning
star in Aries, rising about S A. M in the midthe month On the more ing of the 5th he is in exsely close conjunction with Venus, the two being only four minutes of arc apart—too close to be separated by the unaided Unfortunately, the eye. Unfortunately, the closest approach is at about 9 A. M by eastern standard time, when the planets are invisue in the daylight, and they will be about a quarter of will be about a quarter of a degree apart at 3 A. M., when we can last see them Observers on the Pacific coast will be able to follow them until they are almost too close to be

separated by the eye.

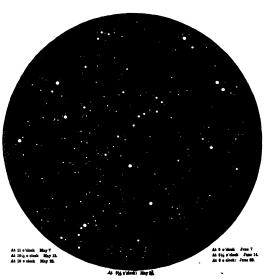
Uranus is in Sagittarius, and crosses the meridian about 2 A. M. in the middle of the mor

Neptune is in Gemisi, too near the sun to be observed.

The moon is new at S A. M. on the 7th, in her first quarter at 11 A. M. on the 14th, full at 3 P. M. on the quarter at 11 A. M, on the 14th, full at 3 P. M. on the 29th.
And in her last quarter at 11 P. M. on the 29th.
Bile is nearest the earth on the 3th, and furthers
away on the 18th. In the organic syround the heavens
also possess Vesius and Sattern on the morning of the
4th, very clease Vesius and Sattern on the morning of the
4th, very clease Vesius and Sattern on the morning of the
6th very clease Vesius and Sattern on the morning of the
6th very clease Vesius and Sattern the the set of
the plainten (not day's labor, Jacpon after the path has
refrence to the set of the set of

risen not the manners states, box will be of speciest to western charryers, i Bestdes these, she passes Mercury on the 6th, Neg-tune on the 8th, Mara on the 12th, Taptier on the 15th, and Uranus on the 26th, some of these decays.

By the addition; of magnetic to confor pdf. It is marable to obtain a matrice in the desire of a product which contains a matrice in the desire of a product which contains after per mean of motive of any object of the contains after the cont



RIGHT SKY: MAY AND JUNE.

stars themselves. The two bright stars  $\beta$  and  $\gamma$  in Stars Legenseives. The two Dright stars p and y me the Dragon's head are very conspicuo a. Two others, of which only one is shown on the map, make up with these an irregular quadrilateral. The faintest star of this. p Draconis, is an interesting double, sep-

with those an irregula, quadrilataral. The failures attar of this,  $\sigma$ -bracenia, is an interesting double, separable with a field-giass of high power—the, distance of a the components being almost exactly one minute of are. The star  $\alpha$  Draconia, about midway between the bowl of the little Dipper and the end of the handle of the Great Dipper, is notsworthy as the pole-star of the ancelest Rigritians. About the year 830 c, the closestial pole, in the course of its precession motion, passed very near this star, so that it held the same place in the heavens then that Pularia does to-day

to-day
In the northeast we see the great cross of Organa,
and the brilliant Vegs, and due east Alistr has just
fress Higher up is Hercules, and seath of him
Ophitudes, estampted with the Serpent which he carries. Boddes in right correback, Arcticirus being seene
19 dags nouth of the mentih. Low in the noutheast is
Scorpio, not yet fully rissue. On the right is and alove
in the Insignificant group of Libra, and the extensive in the
Complex of the Complex of the Complex of the
Complex of the Complex of the Complex of the
to south, stretches the might'r length of Eighten, with

## A CLOSE MAIN THE LATER MAINTHOUSE STREET diversely for the "Dr. of many modifications of the "Dr.

hunks design since it was first introduced in 1904. The Ariestican modification is distinguished by the materians arrangement of the gun turrets, the German species has avenues or the gas uturner, he terminally the powerful secondary armament and by the re-pected introduction of the triple turner. It has re-isabled for Italy—the home of constructive genius and the real birthplace of the dreadnought their—to comhine in one ship the twin turret, the triple turret, and

the context-line arrangement. Four ships are under construction for the Mediterranean power Ose, the 'Dante Alfghiert' was laid given last summer, and is to be launched in September. It has ease of the other three ships, as a second of the sease of the other three ships, as ansed "Conte of Carvor." "It is difficult to say whether their power has been under or over raised. According to the context of the other three ships, as a second of the other three ships, as a second "Conte of Carvor." It is difficult to say whether their power has been under or over raised. According to the context of the other three ships are three or three out, however, that they will

now turns out, however, that they will have no fewer than thirteen 12-inch weapons. This is a larger number of sinweapons. This is a larger number or sin-gle-caliber guns than has ever been mounted in a modern ship, although the Japanese "Satsuma" and "Aki" each carry four 12-inch and ten 10-inch, to say nothing of twelve 6-inch The ar-rangement of the guns in the Italian ships is distinctly novel There will be salps is distinctly novel. There will be three three-gun turrets, one forward, one aft, and one amidships, while a twin turret will be placed forward and aft, so as to bring its guns to bear over the lower turret. There will thus be a full broadside of thirteen 12-inch guns, with a fore-and-aft fire of five The secondary

a fore-ancient are of ave. The secondary battery will consist of eighteen 47 inch rapid-fire guns, besides the same number of 3 inch. Three under-water torpede tubes will be fitted. The displacement will be \$4,000 tons, the main armor belt 18 inches thick, and the speed 22 knots

The arrangement of the armament in the "Dante Alighfer!" is precisely the same as that in the other three ships, save that the midship turret is suppressed three ships, save that the midship turnet is suppressed, and that the after turnets are on a lower level than those forward as will be seen from the accompanying sketch, the deck runs straight from the via term in the three other ships. The "Danta" will have a displacement of 18,300 tons and a speed of 33 knots. The four ships are to be completed in 1913.

## HOW THE LAKEVIEW GUINES WAS CAPPED.

Last week's issue of the SCIENTIFIC AMERICAN O tained a description of an oil well in the midway dis-trict near Bakersfield Cal, which on March 15th sud-denly blew out the drilling tools and became the Lake-

view Gusher, the largest ell gusher in California, blowing out at the rate of over 40,000 barrels of heavy crude oil a day The force of the gas pressure was so terrific that the derrick was ripped to pieces, and oil spray was literally sent for miles in every direction. How to cap this well was a serious cap this well was a serious problem. For several weeks no attempt what-ever was made to check the flow. A tentative at-tack was then made to fasten down a wooden roof fasten down a wooden root over the head of the well

ough the roof was made of 16 by 16 timbers, the

over the hand of the well address, the recover was made of 14 by 16 timbers, the gualant ture them to spinitures.

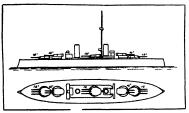
The problem of the problem of the problem of the several guide of the problem of the several guide of the problem of the several guide of frontains in addition to the main stream. These additional openings were smothered by means of spoissenire butwards or brash and sand. A steptish of heavy shade was considered to the spooting with. The walls of the subclade were 15 feet side of heavy shade was deep that recovery the several sever

### Scientific American

hies, which had served to haul up the raft, were then made fast to buried pipes. The result was that the stream of oil was huried against "hat was virtually a rast anchored in midsir. The rast, held up by the a rate memorau in midair. The raft, held up by the force of oil, is about 15 feet above the mouth of the well and just above the stockade Although this force not actually stiffs the grash of oil, it has very much lowered the beight of the fountain, and thus has resulted in a vast saving of oil

## A National Good Bonds Laborato

The Agricultural Appropriation Bill approach
the Agricultural Appropriation Bill approach
the Agricultural Appropriation Bill approach
the Agricultural Agricultural Agricultural
\$10,000 to eachbit the Secretary of Agricultural
though
to the Option of Agricultural though
out the United States, to make investigations in yeard to the best methods of roof making and propare publications and saskst agricultural colleges and
appriment stations in dissensitiating information on



NEW ITALIAN BATTLEMENTS WHICH WILL BE THE FIRST TO CARRY THIRTEEN TWELVE-ISON GUNS.

this subject. In pursuance of this authority, the Of fice of Road Inquiry was established

During the next two fiscal years the appropriations and the wording of the bill remained the same The and the working of the bill remained the same The appropriation for the fiscal year 1897 was reduced to \$5,000, and a provision was added authorising the in vestigation of read-making materials in the several Biates. The appropriation remained \$8,000 annually during the fiscal years 1898, 1899, and 1900, and no change use mean years 1888, 1889, and 1900, and no change was made in the wording of the bill, although the name of the office was changed from "Road Inquiry" to "Public Road Inquiries" in the facal year 1899

The Agricultural Bill for 1961 carried an appropr ation for \$14,000 and provided for conducting experiments in the city of Washington and elsewhere and collecting, digesting, reporting, and illustrating the results of such experiments. The appropriation for 1803 was \$20,000, and the bill provided for the in vestigation of the chemical and physical character of road materials. The language of the appropriation work of the office is divided into three branches, namely, the laboratory work, which is organized as the Division of Tests, the engineering work, which is known as the Highway Division, and the economic, statistical, road management, and miscellaneous work which is organized as the Division of Road

As the Division of Tests, which may be regular as a National Good Roads Laboratory, is consi as a National Good Roads Laboratory, is considered to be the most completely equipped road material laboratory in the world we give the following detailed description of the plant and work: The Assist ant Director and Chemist has charge of the Division of Testis if he has as his assistant as twitting contineer and an assistant chemist The chemical laboratory is under the insuccitate direction of the assistant chemist and the physical testing of materials is under

chemist and the physical testing of materians is unow the testing engineer. There is also in the Disision of Tests a petrographic laboratory with a petrographic to charge. The routine testing of ma-terials conducted by the Division of Tests consists of microscopic and chemi-cal analyses of specimens to determine the winears (amounting and proper their mineral composition and proper classification, and physical tests to deter-mine their comenting value hardness, toughness, resistance to wear, water ab sorption, and density (Bulletin 79 Bu

reau of Chemistry )
In addition to the routine tests spe cial studies are made regarding the use and composition of asphalts, oils, tars, compounds various emulsions, and sait solutions, with the view of preventing dust and preserving road surfaces (Bul-letin No 14) Other investigations in clude research into the decomposition of rock powders (Bulletin No 28, Circular No 38 and Farmers' Bulletin No 239), the testing of clays for use in paving brick brick burnt-clay and sand clay roads (Bulletin No 27 and Farmers Bulletin

No 311), and the corresion of iron culverts bridges. and fence wi wire (Builetin No 30 and Farmers' B

The equipment for the physical testing laboratory is as follows large impact machine for testing paving brick, impact machine for testing binding power of rock dust, impact machine for testing the toughness of rocks, Olsen testing machine for tensile, cross b ing and compression tests, capacity 20,000 pounds, Richle testing machine for testing tensile cross-bending, and compressive strengths capacity-200,000 pounds, delicate platform scales, bytemalic machine for molding briquettes, torsion balance, abrasion ma chine for testing resistance to wear of rocks, vacuum pump, dismond saw and grinding laps for making thin rock sections for microscopic examinations, ball mill for grinding rock samples into powder centrifu gal pump, diamond core drill small rock crusher, grinding disk for testing the hardness of rock sam ples, battery of pebble mills for pulverizing rock pow

ders, Westinghouse air compressor, hot air bath, gas furnace, and a com plete cement testing outfit consisting of a Fairbank torsion machine. GII more s needles, standard sieves, briquette moids, soaking tanks, etc

The equipment for the The equipment for the machine shop where test ing machines and other apparatus are made and repaired is as follows. Spend lathe, engine

lathe, drill press, power hack saw, precision lathe, saw table, universal trim-mer. The chemical labo-

ratory is equipped with the necessary chemical apparatus used in making analyses of rocks clays cements, and bituminous substances it is provided with com-pressed air vacuum, gas, hot and cold water steam, and electricity. The petrographic isboratory is provided with a petrographic microscope of the latest Fuess model, which besides the usual attachments is provided with a revolving analyzer in the tube to aid in the determination of very low doubly refracting mineral, and a Schwartsman scale for the measure-ment of optical axial angles. The methods used for mining and classifying rocks are fully set forth in Bulletin No 31

The road material laboratory was established in December, 1900 and from that time until November 30th, 1908 3 018 samples of road material were tested from practically every State in the Union. The results of tests made up to January 1st, 1908 and a brief description of the present methods of making routine are shown on Form No. 28



ARRANGEMENT OF STOCKADE AND RAFT WITH WHICH THE LANGUISM GUSSER WAS CAPPED. bills has remained practically unchanged up to the

bills has remained practically unchanged up to the present time, except that the name of the office was changed from "Public Road Inquiries" to the "Office of Public Roads" and a statutory organisation was provided in the Agricultural Bill approved March 3rd, 1986. In the appropriation bill for 1989, the rent or purchase of road-making machinery was forbidden The total appropriations to the facal year 1989 inclu-sive amount to \$473,440. The estimate for 1999-10 as approved by the Secretary of Agriculture is for

The Office of Public Roads is under the jurisdiction of the National Department of Agriculture as shown above. It has no administrative duties and exercises ntrol whatever over the roads of the United so control whatever over the rodus or the United Bitakes, its functions being entirely scientific and edu-gationals. No appropriations are made by the national governations for roads except on government reserva-tions. At the present time there are sixty-seven on-night and emissioness on the rolls of the office. The

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## NEW TWO-CYCLE MOTOR'S

DEFECTS OF THE TWO-CYCLE ENGINE AND HOW THEY ARE OVERCOME:

A belief in growing among gas negline experts that the greatest improvements it gas and gamble that the greatest improvements it gas not gamble the greatest improvements in gas not gamble shire gas to greate place gamble which gets in reason lower from its cylindees by elliminating the idle revolution of the four-cyling. It is conceded that four-cylin design has practically reached the limit of its possibilities the advent the automobile having drawn the services of the brightness men in the gas engine field, the result of whose-work is seen to-day in the splendid examples of gas engines found in even the classers third of sutness and the service of gas engines found in even the classers third of sutness that the four-stroke cycle with its small utilization of one-half of the pitton arrokes will be accepted as the finality of development, the two-stroke cycle as now applied to quality unsating for reasons that are familiar to all students of the question.

It is apparent that the chief efforts toward improvement are now being made with a view to eliminating the defects herrisfore common to the two-cycle type. The chief defects of the usual two-tycle engine may

be summed up as follows

I The explosive mixture is taken into the crank case resulting in leakage and in possible explosions to the hear.

2 The new charge comes into direct contact with the hot burned gases, causing possible pre-ignition and some loss of gas at the exhaust

3 The charge is not large enough in volume because the crank case is an altogether inefficient compressor on account of its very large clearance. This means a small charge and also a large porcentage of dead gas left in the cyllinder.

dead gas left in the cylinder

4 The power is not increased materially by the
double number of explosions because of the weak

charges and your economy

Several recent two-cycle origines meet those defects
in different ways. The Newcomb engine was recently
exhibited before the Automobile (Shi of America This
is a two-cycle engine using the crank case to supply
exhibited before the Automobile (Shi of America This
is a two-cycle engine using the crank case to supply
exhibited before the three three three and
The first is injected directly into the cyllader from a
plumeer pump, the quantity before controlled by regulating the stroke of the pump. The gasoline is directed
downward into a small cup on, the bend of the piston.
When the piston rises this cup or pocket in in the
vicinity of the spark plug on that there is always an
on very light lead. This arrangement avoids several
of the defects of ordinary two-cycle engines were
the charge is limited, however by the amount of air
which can be supplied from the crank case, which
would scarvely exceed 75 per cent of the displacement
of the piston, leaving the other 25 per cent and the
will undoubbedly be more powerful, economical, and
reliable than the ordinary two-cycle motor

reliable than the ordinary two-cycle motor
Another improved type of two-cycle engine is that
employing a differential piston. This engine leaves
out the crank case entirely as a means of supplying

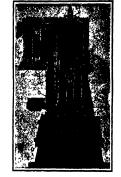


Fig i .- Shortt two cycle motor.

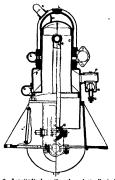


Fig. 2: - Longitudinal section through the Broderick two-cycle motor

the charge or six and compresses the charge philicity. For a sanniar chamber formed by a differential set we dismested principal set of the charge of the ch

A good idea of the muthod of operation of this motive can be had from the disarrans we reproduce The cross-section of one of the cylinders shows the large plates of the cylinders shows the large plates of On the down stroke the large plates of On the down stroke the large plates of the cylinders shows the compressor plates of the same than the cylinder of the second cylinder of one to the cylinder of the second cylinder of one the exhaust port, it uncovers the indeed cylinder of the same cylinder of the second cylinder of one the exhaust port, it uncovers the indeed cylinder of the same cylinder of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and is directed upward by the deficient of the cylinder and the cylinder and the directed upward by the deficient of the cylinder and the cylin

rance serious damage. The new cycle motor is a recent invention of C A. Dawley, number of the American Society of Mechanical Control of the Charlest and the Control of the Control

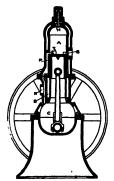


Fig 4 - Section of Dawley engine.

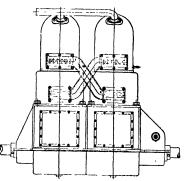


Fig. 3.—Side elevation of Brederick two-cycle neronantic motor

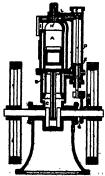


Fig. Les Section of Danrier engine.



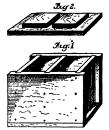
## A ROUGE AND READY GALVANIC BATTERY.

The back lattery for experimental work in the workmop or laboratory is one of the respis-and-resty type shat will give a moderate current of electricity for sightfree of root superses with an electromotive for all it of voits. Such abstary is suited for the excellent of a powerful electromagnet, for magnetising surposes, operating an induction coil, and for electrogister plating, electro brassing, or electro-coppering either by the hot or coil process, and for electrogisted by the hot or coil process, and for electrogisted by the hot or coil process, and for electro-grid for The following description will enable surpose

parposes, operating an induction coil, and for ever to platter platting, electro brassing, or electro coppering either by the hot or coil process, and to electro gith part to the control of a battery consisting of two coils canable of being coupled so as to give the current of one large cell or in series so as to yield the current of one rall and the electromotive force of two This inter plan is the one best sutted for coppering, brassing or electro lickeling. This type of battery has been used, and is still used by the writer for all the purposes mean timed, to over the years, so it has been put well to

the test of experience. The wood used in making the battery must be thor oughly well seasoned. An old board that has been kept years in an office or a lot will prove to be just the thing required. The board should be 1 into thick may be the provided of the board should be 1 into thick may be the provided of the provided of the battery. The side pieces unsat the growed as as to review these pieces with a very nice fitting joint as shown in Fig. 1. The bottom pieces must be made as aboven in Fig. 1. The bottom pieces must be made as aboven in Fig. 1. The bottom pieces must be made as aboven in Fig. 1. The bottom pieces must be made as aboven in Fig. 1. The bottom pieces must be made as aboven in Fig. 1. The bottom pieces must be made in linear to the pieces with a very nice fitting joint as aboven in Fig. 1. The bottom pieces must be had in high the pieces with a very simple of the pieces with a very hould size be conted with a thick sheline variable from its window of the outer surface of the squares. They should size be conted with a thick sheline variable into the side pieces and the code of the division pieces must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well coated with thick sheline variable from the side pieces and the code of the division piece must also be well to the pieces should be di

When the battery has been put together it must be lined on the inside with a coaling of burning hot pitch. Use an old saucepan to melt the pitch in Pour some into one of the cells and tilt the battery first one side then another until all four sides have been submitted to the hot pitch. Pour the pitch have into the pitch when the pitch have the pitch have into one end red hot, and press this well into the corners and around the joints at the bottom, so as to secure brass bettery clamps to these with a strip of sheet copper tolded over the top of the earton block This is an important item. Its use will protect the brass clamp from being corroded by the acids. The size vylinders can be purchased with a copper strip and consideration of the control of the control of the analgamated by disping them into subplure acid 1 part, water 8 parts, and then rubbing all over inside and outside with quicksulver. Flace these sincs in the wooden vessel. Make up a mixture of subburdcid 2 pint, water 8 pints in a noncease pitcher, and allow it to become cold in a doubter vessel make a mix ture of water 4 pints, blurcands of soditum or pota-



A BOUGH AND READY GALVANIC BATTERY

sium 12 onnews subplute and half a plat. Allow this also to become rold. The lattive is now charged by pouring the bithren ste mixture into the provan peak around the carbon blinks and then pouring the sulpaire acid mixture into the outside square around the interpolation. The lattive is now ready for any pur poso required and will keep in good action for also the cylinders amust be removed and plazed into a story area of the cylinders must be removed and plazed into a story area of the cylinders must be removed and plazed into a story area of the cylinders and the cylinders are the cylinders and the bithronaut fure must be returned to the viewel it was made in The carbon block can also be stord on one upon blot ting paper or in a wide mouthed pickle bottle. The sail public acid mixture can be allowed to round in the wooden battery call of the cylinder of the cylinders of the c

## SAFE GASOLINE TANKS

As gasoline explo- one are due to a mixture of gasoline vapor with air 'accidentally ignited, of course) ! ! think the air in a gasoline tank could well be re placed either by water or a non-oxidizing gas such as

carbon dioxide, after the manner here illustrated in the first two designs water is used in Fig. 1 the weight of the water forces the gasoline out of the lower tank through the stopics (B. The water is no constructed that if floats when the water reaches it, closes the opening, and thus prevents the water from flowing out. To refull the tank with gasoline,

a sut tion pump is connected to the suppose A and the gasoline is also a suppose A and the gasoline is supposed in the suppose B. The latter prevents the gasoline from

escaping
Fig 2 is practically the same, but to discharge the gasoline through the stop-

THE TABLES SAFE. through the stopcock B air must
be pumped into the lowe, part to force the water into
the gasoline tank above To redli this tank with gasoline, the stopook at A is opened, letting the air out
and the weight of the water then siphons the gasoline

into the tank above through the valve and stopcock B In Fig. 2 a carbon dioxide tank is connected to the pipe A and the pressure of the gas then forces the gasoline out through the pipe B

In Fig. 4 the stopcock A is connected to the water mats or pipe when the pressure of the water forces the passine out through the stopcock B. The valve C prevaists the water from escaping into the gasoline can through the stopcock B. To refill the tank, the stopcock

A is closed and stopcock D is opened, and the water flowing out through the latter will draw the gasoline into the tank through stopcock B. The vaive B is adjusted to sink in gasoline and thus close the outlet, preventing escape of gasoline through the stopcock D.

### PLUG COMMECTOR

To make a plug connector for use in an electric pich socket, all that is required in a burned out incandrescent imm and a number of freet of heavy imm,
leaving only the base. Then break away the
glass tube that protects the leading in wires, being
careful not to fulure them. Now untwist about a foot
of the lamp cond, eareage the ender clean and slip a
short length of rubber tubing over each end. Solder
the ends to the leading in wires in the lamp base and
then push the rubber tubing over each end. Solder
the ends to the leading in wires in the lamp base and
then push the rubber tubing over each on a for form
a limited top loster of Paris, letting it project up
above the top of the plug about an inch so as for form
as insuited top to acree the plug in by This plug
connector is autiable for small motors, portable image,
and any other apparatus that draws only a small cur
rest. It exame to be used for large currents as the
heavy current used fase the reddinglish wires in the
heavy current used fase the seeding in wires in the

## A SIMPLE APPARATUS FOR EMPTYING CARBOYS

A very simple, effective and easily set up appare attus for emptying carboys of acid set, may be made in the following way from materials found in very laboratory. This will be found to be, for aspector to the acid pump or the ole-fashioned method or till ings the carboy, eathlying the liquid in a junc data then pouring it into bottles. For no futures can we ape, and this is an important factor when the ing with strong ammonia or hydrochloric acid capites of said. Set the strong ammonia or hydrochloric acid capites of said any unable of future from a carboy mather liquid any unable of the tiles from a carboy

Say one wishes to fill with hydroxidoric acid or another liquid any number of bottles from a carboy Fit every one of the bottles with two-ho ed imber corks and then through each hole put a piece of glass tubing bent in the form of a right angle with addes

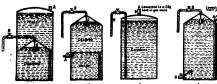
orks and then through was hole put a piece of yikas tubbug best in the form of a right angle with adden about three Inches long. Connect one piece of giasa tubing In one hostile to another piece in another to the with a annull piece of rubber tubing in the respication of this bottle with a north piece of this bottle with a norther piece in another bottle out no on until you have all the builtes connected up in now setspitch line.

Connect the free tube at one end of the line with a piece of rubber tubing to a long bent glass tube passing to the bottom of the carboy

Attach the other free tube at the other end of the row of bottles to a glass filter pump or any other suction apparatus with a piece of thick walled rub ber tubing. Then we have the apparatus as illustrated herewith.

Turn on the water tap connected with the filter pump and the acid will be drawn up the tube lead ing from the carboy and into the first bottle. As soon as this is filled the acid will run into the second bottle, and so on until the carboy is empty or

soon as that is most the able will red into the second bettle, and so on until the rarboy is emply of the requisite number of bettles are all the second bettle are in the consert is to fill say there or four buttles. When those are filled they can be disconnected and others put in thelp place. But it must not be forgotten to turn off the water tap and so stop the flow of liquid before making the change



SIMPLE METHODS OF MARING GASOLINE TANKS SAFE.

a perfect coating of pitch at these joints. Now pour the best pitch into the cell again so as to be sure that all parts are well convent. Trant the second cell in title nitanner. Raving the case now well put together, shight the centrale by giving it two ceasts of since twenths mixed with cross (cettle of from). This maple will perial the said since used in the cells and give quite as the shinks to the work. To complete and the contract of the cells and give going as the said since the cells of the cells and give going as the cells and to the work. To complete the cells and the cells and give going and the cells and the cell



APPARATUS FOR EMPTYING CARBOYS

If the liquid in the earloy is subbarrie seld oil of vitrol) or any other liquid that stroke rich the text bent tubes connecting bottle to bottle my be made in one plece and if care is taken to push the ends of the tubes below the end of the cryst the liquid want reach up to them and so they still be plaud want reach up to them and so they still be to be burt in the slightest. In fact no rubber content may be made use of except from the surface must be made used to except from the surface of the course it is more convenient to use them.

A glass filter pump is the lest to use because any fumes that may perhaps come over have no corrod ing effect on it, as they would have on a metal one

### MAKING YOUR OWN PRRPUNERY.

BY A. H. ATEU

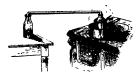
The manufacture of perfumery has always seemed a difficult process to many, and without doubt the blending of certain kinds of perfumes is a matter of much scientific and skillful manipulation, but on the other hand, the most commonly used perfumes can be made at home with simple apparatus and without much expense or trouble in many parts of the coun-try, flowers are so abundant that one can harvest all that are needed for manufacturing at home perfume enough for a year's use

A perfume garden should prove as profitable as of A pertumo garden should prove as prontance as one of fruits or exectables. We plant gardens for cut flowers and for flower seeds, but fow raise flowers for pertum making Khough perfumory is sold in this country annually to make a yearly tax of nearly ten dollars on every family. This amount is not evenly distributed, but each woman spends enough to make it worth while, if she has the garden space to try a hand at making her perfumes at hon

One must devote time to the cultivation of certain flowers which thrive luxuriantly in the vicinity in many parts of the country roses thrive so luxuriantly that fields can be sown with them, and an abundant crop raised. In other sections the rose is too slow-growing for this purpose, but the violet takes its place Again, it must be the jammine, the tuberose, the orange blossom, or lavender Whatever flower it is that thrives and possesses delicate but powerful fra grance should be chosen for the work

grance anoual no concern for the work
Direct distillation is the most satisfactory way of
making pertunery. The still is a simple affair and
it can be made out of articles found in the average
home. Take an ordinary tin oil can, scour it, and some rake an ordinary in oil can, scour it, and purify it of all oil odors Stop the spout completely, and fit a cork in the top through which the oil is poured From a hardware store get four feet of cop-per tubing (tin or galvanized iron pipe may also be used) The tube should be bent downward at the

The tin can should be filled with a nound of fig



HOME-WADE PERFUME STILL

petals gathered fresh in the early morning. Pour over these petals eight fluid ounces of alcohol. Then puthe can in a saucepan balf filled with water, and plaon a stove, where the water can be kept at the boil-ing point. A hole should be cut through the cork of the can just large enough to receive the metal tube. the an just sarge enough to receive the metal tune. Place a quart jar on a table nearby, and insert in it the other end of the tubing. This jar should not be sealed, or distillation will not go on properly. When the water boils, the alcohol in the can is beated, and this process extract the perfume from the flower petals, and gradually causes distillation through

the tube into the cold far on the table. The alcohol thus distilled will carry with it the true attar of the Alcohol has a peculiar property of extracting and holding the scent of flowers. As fast as distills tion goes on, the contents of the jar should be empties into giass bottles and socurely corked and sealed with paraffin In blending perfumes of several flowers, do the mixing after each one has been distilled sens-Do not mix the flowers in one still

Another method of using this still is to employ water instead of alcohol for distillation. Instead of attar we get the essential oil of the flowers, and this rises and fleats on the surface of the water in small globules, which must be akimmed off carefully, and immediately bottled and kept cool and air tight. When sufficient oil is obtained, it should be mixed with alcohol to retain the odor indefinitely One may with alcohol to retain the color incernitive to the may distill with water any number of kinds of flowers, and with the essential oil properly bottled, blended perfumes can then be made. A few drops of several kinds of oil are poured into a bottle containing a certain amount of alcohol, and when shaken thoroughly one has a delicious fragrance for home use. For instance, eau de cologne is made by pouring into a glass bottle a pint of alcohol, and adding half a drachm of home made attar of resemany and twenty drops each of the attar of orange peel lemon peel, and bergamot pee The distillation of these fruit peels is another desireble home industry. Cut up fresh orange or lemon peel and place if in water in the tin can, and heat as for use in flower leaves. The essential off of tilese peels will then be gradually distilled into the other receptacle fikim of the globules, and confine in corked bot-

es distillation, we have the protion, which anyone can do at home with little treaties and expense It is slightly more complicated, but it will extract the pertune of more delicate flowers, such as the violets, with greater success. This process consists of covering two large shallow pans or soup consists or covering two large analow pane or sovul plates with a layer of melted suct. The layer should be half an inch or more thick. When the fat has hard-ened, gather the violets, jamine, or tuberose flowers, and cover the suct thickly with them. Then place one and cover the suct thorny with them Then piace case plate over the other, and force down firmly. Wrag the plates tightly in paper, so that the perfume will all be retained in twanty-four hours the suct will have absorbed nearly all the perfume. Then quickly remove the dead petals, and replace with more frosh operation for several days or eve once Ropeat this operation for several days or even for a week, so as to secure a strong supply of doirs. When enough potals have been robbed of their odn; plees, and drop them into a wide-monthed bottle or glass jar containing slooked. The transference should be made as quickly as possible, and with least expo-sure to the air. Then close the bottle or jar, and seal with parafilm to make air tight As the sent absorbed the fragrance of the petals, so will the slooked rob the suet of its concentrated extract. Every day the bet-tle should be shaken a little, and in a fortnight the alcohol should be poured off through a strainer into bottles and corked

Besides making the liquid perfumes, one should consider eachet powders and perfumed pastes. These have their use in every household. A rose paste is made by steeping rose leaves in water, and pounding with a mortar until reduced to a paste. This macers tion should be thorough, and can be done with an ordinary rolling pin Now add a drop or two of your home-made attar of rose, and permit the paste to dry in an air-tight receptacle The paste will grow quite bard, and can then be cut into any shape desired. A piece placed in a drawer will scent the place for a and can then be cut into any shape desir long time If the pieces not in use are kept air-light they will retain fragrance indefinitely, and will always be ready for instant use Laid in linen and clothes see, they add that subtle fragrance to the fabrics which so many like

which so many life
Sachet powders are as numerous and as varied in
fragrance as colognes. One may compound them out
of flower pocials, agics, and partumes to suit individual preferences. The art of making sacheta is very
essential cits such simple articles purchasable at any
drug store, as iris root, musk, and rochineal (the last
for coloring only) and such apleces as clows, cimas
mon, and ginger, we have all the materials that a
mail laboratory requires for making a doese kinds
of popular sphetes. Lavender seeds rationed and curved
this color Another is manufactored by mixing trip this odor Another is manufactured by mixing tris root and ground cloves with a little musk and attar of roses, the whole moistened with a little alcohol, and then rolled and kneaded into a paste, which in time grows quite stiff A few pieces of this distributed grows quite sum A rew pieces of this distributed around in the clothes press will add a delicious edor to garments. For gifts, appropriate bottles and rib-bons or boxes may be purchased cheaply at the stores, or silk and damask can be obtained for concealing sachet or perfumed pastes, and pin cushions may be made and scented indefinitely by inclosing a good piece of the perfumed paste in the center

### AN EXPERIMENT IN SOURD.

Those who have had the good fortune to travel through a virgin tropical forest could hardly fall to have been impressed by the death-like stillness which pervades all nature between the hours of 1 and 4 This is the thermal noon of th when all life, weary with the battle with the terrible heat, seeks repose in a much-needed siests. No sound is heard save perhaps the slight rustling of a leaf. or the plaintive grupt of a tardogradus as he and the call of his mate, or reaches out for a new case

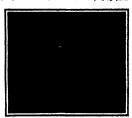
leaf with which to satisfy a never-ending appetite
Under these circumstances Humboldt, the great Ge man traveler, who was camping twelve miles from the fails of the forlince River, was actositisting in that has been considered in the fails of the forlince River, was actositisting the fail that no sound from this source reached his est, while the words were reached his early, during the shiply, when the words were reached as particle pandemonatum by the shrinks was readed as particle pandemonatum his particle pandemonatum for particle pandemonatum for particle pandemonatum for source was the same pandemonatum for source wa man traveler, who was camping twelve miles from the Potomac railroad bridge, while during a calm duty day they listen in vain for the goine of the over the Pot moving our? The very natural explanation that the noise of the day traffic masks the sound of the ears does not suffice, as the experience, of Huntieldt preven. Some light is thrown upon this problem by a restinal

of the experience of the wester, was one a longer a but force or first part of the same and the same as the same a

with conditions apparently measurements.

Prof Tyidall has described this phenomenon, attributed it to hope spanes of art, different in persure and density from the surrounding alphone, drifting in between the ear and the steam and the steam of the surrounding alphone, drifting in between the ear and the steam and the steam and the steam of the surrounding alphone, drifting in between the ear and the steam of the surrounding alphone surroundi sound These "ear clouds," for veritable clouds are, as far as the human ear is concerned, it

are, as tax as the human ear is conterred, the perfectly transparent to the exp. possess in a mar our degree the faculty of reflecting sound waven. Following is the description of a simple experies which, if thoroughly understood in all its bearing will enable one to explain some of the most ass will enable one to suplain some of the most applimatter that the supplies of the superior of note 0, which is due to 513 vibrations per second, es-ergise it by bowing or by striking it with a hammer, and hold the fork before the mouth of a bottle, say 6 inches deep and 2 inches in diameter. Instantly yes 6 inches deep and 2 inches in diameter. Instanty yet hear an increase in the intensity of the sound, be-cause the column of air inclosed by such a bottle will vibrate the same number of times per second as the fork. Now hold a second similar bottle between the prongs of the fork, as in the accompanying photo-



AN EXPERIMENT IN SOURCE INTERPRESENCE.

graph, and the sound is practically extinguis cause the creats of the waves entering one bettle colli-cials with the troughs of those entering the other Under these circumstances there is always interfer-ence, or silence Now introduce a piece of cardboard between the mouth of the bottle and the vibrating between the mouth of the botts and the vibrating princy, the colditions of interference are destroyed, and loudness is restored. But an ear cloud is quite as effective as a piece of cardboard Place a burning match or a hot poker beneath the mouth of other or of the bottles, and as the tibu layer of warm at reaches the opening it acts as a curtain, reflects the cound waves, and instantly the loudness of the tork is restored. Thus is desconatives as significant and wonderful fact, the power of a thin layer of air to reflect sound quite as effectively as a board. Now, what are the physical conditions obtaining during the day between the ears of the citizens of Washington and the bridge over the Potor nac River? The st and the bridge over the Potomac River? The sun is shaining, the strongbare is still, a hot structure of air rises from a metal root, another slightly cooler from a grass pice, another of a different temperature from a concrete street, etc. Many strate of different tem-peratures intervene between the ear and the bright, As we have just observed the effect of one structure, we can readily realize their parties the grave of completely estimated the power of completely estimated the spins of the nowing trains. At night, on the outers, the at is homosuneous, the wives are unimpeded and strike the control of the control of the control of Bearing it mind these facts, many opportunity is explicable phenomena become as element in the mosaday

The use of forcing tasks in deposition the best force of alter to much other than it is moved to the control of the control of



Comparing Change on Confessions.

Polymerical Country Country Change of Confession Country Cou

The adjustment derives therough shift varieties of pair this teature. The control of the control

Historical Savietes, Mixon Philosophia, Paris Villago, S. W. Mixon Philosophia, Paris Villago, S. W. Mixon Philosophia, Paris Villago, S. W. Mixon Welch a starte in which has size it for diso the farmace, the top of which is kept closed as the farmace with a top of the size of the control of the size of the control of the size of the control of the

DO AND WORM MILLING MCHINE.—
Into AND WORM MILLING MCHINE.—
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moving operation.

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of General Interest.

AMCHOS.—J W Near, Keslis, Havail.
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internant and dervenied in number so that he shades may offer the requisite numbers. If the property is received to requisite numbers. If the property are not to the requisite number of the property and the property and the property of th

recognit and in a natural manner, prevent singing of sounds with those external, and affords a self-contained and perfectly balanced amplifying born for sound reproducing ma-others.

chlores.

DENTAL CUSPIDOR—I M Hats, Union,
B. C. An object here is to provide a pertable
complete which may be flushed by a stream of
water operated by compressed air. A further
object is to provide a device in which the
flushing operation may be performed through
the instrumentality of a foot lever attached
to the derries, thereby permitting the destint
to we both hands in other work.

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### Heating and Lighting

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occurate residually taken parts and niced in
causing parposes.

and smooth in its operation, and to provide a mechanism whereby the display members are brought together to present a continuous surface

sortace

BUBGLAR ALARM --W G THLIMAN, New
York, N Y This alarm is more especially
designed for use in connection with doors so
that when the door is opened by a burglar or
other unauthorized person, then the alarm
mechanism is artusted to sound a bell, and
when the door is returned to closed position
the sounding of the bell in temporarity con
tioned

Prime Movers and Their Access

Prime Rovers and Their Accessories.

INTERNAL AUGINITION NORDE. P.
DARIER, New York \(^1\) in the present
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the plug at all times in effective condition.

HOTAIN INTERNAL COMMETTERNAL OF

RIUGA.

ROTARY INTERNAL (OMBURTION PN GINE — 3 8 STRWAR Diamondrille, Wys. In this instance the intention of the larm stor in provide an Improved rotary internal combustion engine which is simple and durable in construction composed of comparatively few parts, and solt likely to get out of order, and craining the control of the foliate defaultage the motive agent to the foliate defaultage.

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## NEW BOOKS, RTC.

NAMERIAI CONCESTE WITHOUT MCLES.
By A A Houghton New York
Norman W Henley Publishing Com-pany, 1910 16mo . 182 pp Price, \$2

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## Legal Notices



INVENTORM are invited to commitment with the second of the

and and All request
Ours is the Oldest agency for securing patents
it was established over sixty five years age

MUNN & CO , 361 Broadway, New York Branch Office 625 F St Washington D C



## INDEX OF INVENTIONS For which Letters Patent of the United States were issued for the Week Ending May 17, 1910,

AND BACK BEARING THAT DATE

[See note at end of list about copies of these patents.]





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|   | Lighting Styleton, abusin and reductor one-<br>parts for, W. C. Hine-<br>Laganting accesses, H. C. Why   |                          |
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| 956,009   | Liquide front soulds, a parenting, H. G.   | ##<br> Th                |
|   | ores or other solid matter from A. J. Arbachie<br>Londing and unionding device, U. R. Houles Sile,<br>Lord, W. Cog.  | Í                        |
| 034,197<br>956,199  | Lock artice, T B. Riverne<br>Locking device for windows, transitio, or<br>the like, R. & Flore<br>Locusettre, articulated compound Media &   |                          |
| 834,581<br>939,027<br>938,139<br>931,891<br>937,899<br>937,899<br>934,563<br>934,563<br>934,563   | Joseph Barrow ware or ribbon, E. E. Hobses St. Loven shuttle bimber A. A. Gerckel Loven shuttle bimber A. A. Gerckel Loven these parottels ben med tauban for E. H. Barrow Area shuttle ben med tauban for E. St. H. Barrow S. St. S.  |                          |
| 957 936   | Labricant retainer, J. R. Tu-band , 905.   | į                        |
| 108,421<br>108 030<br>108 03 | Marker segmenting transportation device T see, Jr intle, Jr Marker land I A. Ulrich SAG. Marker land I A. Work She.  | 1                        |
| 1006,711<br>1006,078<br>1006,003  | Martie book N. W. Book. Martie booker H. G. Baukenbagen. Batch back hard. L. Illidevih black hard. L. Illidevih black hard. L. Illidevih blesstring and replacting the meditations of viterating balles, such as marine ver sels, already replacting redects, and the latter appearing for F. Book. Health appearing for F. Stevenson. Medical State of the State of |                          |
| 938,500<br>938,600  |  |                          |
| 918, 114<br>166, 300<br>868, 165<br>935, 331  | Morphismon L. B. Purcell Actual cutting matchine E G. Tout 658,195, 105. Actual cutting matchine E G. Tout 658,195, 105. Actual and ing matchine, W L. Pield Matchine and ing matchine, W L. Pield Matchine, and Matchine E. P. Lamphier 806. Matchine, admit for electric E, C. Lamphier 806.   |                          |
| 908, 155<br>908, 531<br>908, 527<br>908, 070<br>908, 404<br>908, 514  | Morie Morie Marchael  |                          |
| DOM FIT   | Mitt. hamitall J Hartman 830.  |                          |
| 957,046<br>857 858<br>857 858<br>100,458<br>158,058<br>158,058<br>809,868   | Mixing manishs, d. Kirich Moistener, M. A. Memore Moisting manishes, D. Misser Moisting manishes, D. Misser Moistor controlling device L. a. (hapman Motor controlling device Q. T. Kagar Motor andry articlement hydraulis Q. Henry Jr.   | 500<br>612<br>563<br>580 |
| 968,008<br>967,943<br>968,006   | Skotor andrey attachment baydesside O J Henry Jr. wester, better E. Garakie New Jr. wester, better E. Garakie New Janes and State State State New Janes State State State New Janes State State New Janes Stat | 943<br>943               |
| 938 281<br>958 281<br>968 941   | Music sheets epost for W F Bayer 1998,<br>Musical instrument, automatic C A. Robribacher<br>Musical instruments, keyboard for keyed A San  | 214<br>315 _             |
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| DAS 479<br>97 920<br>956, 425<br>934,352<br>9 535   | Packing for agnealing and other like appa ratos, fusible, W. R. Kinnear 908.   | 400<br>273               |
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| 966,376<br>966,045<br>976,665   | Pole another, E. T. Horrad 955. Post binder, E. R. Murphy 907. Posts, construction of H. C. Riewart 955.   |                          |
| 354,626<br>904,216<br>968,608   | Potential digner, J. S. Happignd Power plant hydro-devertic, F. V. Belland Press, Rec Balling press, Press, J. Thomson, Printing markine, rotary Symes & Wich.   | .0)0                     |
| 838,870<br>8-8 617<br>937 970<br>034,286  | Printing press. J. Thomson Printing press. P. Mobiet Projection apparents, W L. Patterson ST. Projection (U days   |                          |
| 107 940<br>108 970<br>957,688<br>908,391  | Properties M Condary Councils L Silvie   |                          |
| 908,088<br>908,617<br>908,187   |  | idi<br>dib<br>dio        |
| 908,075<br>MA,583   | Pomp, retary J. R. Kinney  |                          |
| 909.511<br>984.691  | Position of the control of the contr |                          |
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| Andread market and the second market and the | 954,506<br>957,974<br>958,734<br>958,737<br>957,076<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185<br>958,185  | Content the States, I televatage to the Content plan of the Pollock Campor Clother plan of the Pollock Campor Clother plan of the Pollock Campor Camp                         | 904, 851<br>907,919<br>908, 107<br>908, 710<br>908, 710<br>908, 810<br>907, 900<br>907, 900<br>907, 900<br>908, 800                                      | See tighting expension. B. M. Diron-<br>Cos main, Aydraule, B. M. Messior<br>Cas pipe expergency cut-of, E. A. M.<br>Caser, berning, B. E. Paulon<br>Gate, Craise & Longinaire<br>Geer, change spreed, D. G. Greffin<br>Geer, change spreed, D. G. Greffin<br>Geering variable spreed, J. R. Cox<br>Covering variable spreed, J. R. Cox<br>Change drawing formacy, Raiston & Brig<br>Diagneer, provess and apparents for   |
| And The Control of th | 904,074<br>904,074<br>904,074<br>907,077<br>904,420<br>904,181<br>904,181<br>904,181<br>904,181<br>904,182<br>904,182<br>904,182   | Colore plan. In Proceedings of the Company of the Colored States o                         | 907,919<br>956,147<br>956,710<br>958,073<br>958,615<br>937,941<br>937,941<br>937,965<br>938,680<br>938,680   | das mice. The rest of the state |
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| Actually and the 18th of 30 ft home statements and the 18th of 30 ft home statements are statements as a second of the 18th of | 957 976<br>958 420<br>958 185<br>958 185<br>958 182<br>958,182<br>958,182<br>958,182<br>958,182<br>958,182   | Locks conjunctions w 1 postulations<br>(colline, attachment for, U II Divering<br>Colling and feed merchanism, F II Righ-<br>Collin charter in columnism, E, R, 1 linger<br>(vin charte E N, Hagres<br>(vin charte E N, Hagres<br>(vin charter or change maker J W Jones<br>(vin colline)  | 937,905<br>937,905<br>937,905<br>938,600   | Gearing A. N Adams<br>Gearing transmission, J. K. Kassa<br>Gearing variable speed, J. R. Car<br>Class drawing formers, Raiston & Belg<br>Ulansware proves and apparatus for  |
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| Authorische greefty Awstells Liefer aus der Kriste der Greeft auch der Greeft  | 938,212<br>938,182<br>938,182<br>938,183<br>938,279<br>938,279   | Color-actuated mechanism, E. S. Hingra Color-duste E. Hingra Color-duste E. Hingra Color-dustrolled apparatus, A. Gerstenkorn Color incider or change maker J. W. Jones Color oven, W. Moeller Color, unenching E. Schulte   |  | Classwere proves and apparatus for   |
| Automobile territatis haveing and making the man is. K. Veder Automobile terration construction. South of Automobile terration of the man is the man in the man is the man in th | 938, 182<br>938 181<br>938 181<br>938, 279<br>938, 279   | Coin court is n. respective. A. Gerstenkorn<br>Coin holder or change make: J. W. Jones<br>Coke oven, W. Moeller<br>Coke, usenching S. Baluite  | WE 221   |  |
| According to the Control of the Cont | 938 181<br>938 181<br>938,270<br>938,270<br>937 870  | toke oven. W Mueller<br>Coke, quebeligg E Bebuilte   |  | Ultiling surface for operating in al   |
| Adaption system A h Mercuse Autoback while J K McPhanel Back band attachment K II Griffin Back bedding Back bedding Back by P Hingarable Batter W P Hingarable Batter W P Hingarable Batter Back Back Batter Back Back Batter Batter Back Batter Bat | 938, 270<br>938, 270<br>937 870  |  | 936, 154   | Gictors or shades in the gatteries of de   |
| that it borned with the borne of R. 14 Gridden  Roy Post Peved long  Roy W 1º Fittage radial  Rating proves P A Balter  barrel Billing or tapping devices O Jairr  barrel Billing or tapping devices O Jairr  barrel Post Rating Post Post Post Post Post Post Post Post   | 957 KTD  | Coke, quenching II koppers   | MM,651   | for boiling, M. Falk<br>Glove, swimming, C P Propose   |
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| Seed and show man hims work support W. C.<br>Stewart   | 958,012  | Door controlling me hanton Voight & Hard.  | 953,44T  | Here normiching machine C. H. Hood   |
| Boot and shoes seaching for operating matter betterns of, T G Linui  | 958,506  | Deer or window guest E L. Drinkwater   | MOS,406  | Hert edge Herr H T McLeud  |
| funds and alson machine for tempering<br>outsoirs of G T McLetd  | 1007,902   | Drawer cablest A T Weles<br>Dredging and other smiler purposes, sub-   | 908,203  | Heel saling as like P Woodward   |
| Hoots and above pulling-over machine for<br>J J. Hers  | 967 965  | Drilling machine Barnes & Vincer   | 934 611<br>938,604   | If y Energy in the counter guard   |
| Boring tool flatilwell & Maschuseler<br>Boitle and stoner M Pilz   | 8'14 117<br>8'14 117   | prop signings and matriced material, apparatos for laving J b. North   | BANGTI   | Hering machine E. Wondward   |
| Notice attachment milk T J Reynolds<br>Notice bulles for the inscribes of closures   | 958 112  | Drying textile and other materials, apps   | 808.460  | Heeling machine attachment T U P   |
| device for holding C F Jenkins<br>Beltie expeling machines compresenting de  | 9-8 252  | Duptkaring machine J G Duitey Dust collection apparatus for, O M More  | BAN, OUR   | Heeling machine top lift bolder \ Stewart  |
| vice for I Hartlett 1637 1626 to<br>Bettle cape machine for applying Start   | o 957 928  | Dust pau C W Koertus? Die and making same sulfer B Haugwits  | 938,243<br>938 640   | lieting sachin, work lichter W t   |
| & Turner<br>Settle non reditable W J Buckigh   | 934,833<br>964 084   | Die blen vat. Hauer & Herry 1558,404   | 95N 40N  | Heeling machine work behier T G I  |
| Hottle stopper (J. B. Botton<br>Hottle supporting device milk W. L. Jack   | 154,221  | lagg carries, P O Bulman   | DON UNT  | Helical rolls making ( B. Lockwood ling scraper M Beitt  |
| Dog C M. Niefford  | 908,131<br>938,707   | Thomas<br>Electric tight fatures, awayed boint for ti  | 978'8'6  | Holsting apparatus T il Werber<br>Holsting buckets uncaus for turning  |
| Hos blank making machine F Meisel<br>Hos cover fastener, Nower & Hickards  | 968,001<br>168 022   | Sectio light beinger W Mrt aue-  | 968,448<br>938,209   | Johnston<br>Holsting device F O Carrin   |
| Hes press, Mult J. Osleren<br>Breiding merbine K. Hankin   | 968,168  | Sectro marbines armature winding coll  | 157.677  | Hoisting device ti F Kornig  |
| Hesteling machine W T Le Bisse<br>Heste II Vanderbeck  | 838,512<br>838,612   | Street marking cott for dynamo ti  | UNT 806  | Hook and eye ! M towles<br>Heap slaing and clamping derice !   |
| Brake brake H. Zietose Jr<br>Branding machine H. Walhel  | 938,080<br>938,449   | Electric marblace coil for dynamo J D  | 857 878  | Horseshoe attachment, Il Huth<br>Horseshon attachment Robresht & De  |
| Hrkk films partible blower for K II (allaway   | 9.6 223  | Kiestric machines, coil for dynamo W T   | 957 882  | Horsestor inchise padded W. N. G.<br>Hose braided H. Z. Colo   |
| Brush cleaner G T McLeod   | 956,570<br>937 BHG   | Plettik motor ( E. Avery   | 957 891  | Home coupling back, II M Hoberton  |
| House cutting marking Miller & Class<br>Brook making markinery Payor & Wask  | 958 4.11   | kiectric awitch Collins & Hulber   | 9.0 598<br>0.7 933   | Hose supporter B Ortell  |
| Bresh tooth D II Danek<br>Books dung G II Budke  | 968,371  | Rievator safety attachment C K. & H  | 958,180  | Hotel Jock Arres & Toch<br>  Huselditer H   Ruith  |
| Hasket self closing bettom appropring H. N. Helmilkenback  | 068,323  | Elevator safety device ( B. Pratt  | 058,683<br>958,683   | Hydrani, A. A. Bennett<br>Hydrocartion burner E. G. Wickersho  |
| Huckir K. H. Audreson<br>Huckir W. A. Holden   | 968,085  | Engine New Blowing engine.   | B57 D12  | lighteenthou introc (lark & Nequetti   |
| Huilding that Interiorking criticar I.   | 966,413  | Envelop, II D Naum   | 968 525<br>958 541   | lite maw K K Witt<br>Historianting device for horning was  |
| Building blocks molding artificial stops A   | 958,194  | Envelop and advertising decks J G lut  | 115H 10H   | incandescent light R D (ody  |
| Built op die 3 11 Ames<br>Burner Bee Gas burner  | 964,469  | Excavator C. E. Negtey<br>Eyeglass mount W. G. Fax   | UGH, 15H<br>0.08, 4H5  | Incinerating plant I ric & Bounett<br>Index class worten die C J Walnet  |
| Butter cutter W I Hart<br>Butten H J Herwir  | 955,650<br>958,525   | Eyeglam mounting G A Bader<br>Eyeglam spring A P. Doble  | 110T 024   | lisk well, T. M. McNolty<br>Issortifuge bolder P. Pollard  |
| Button end H N Brothers<br>tablect information and directory E. A  | 937 964  | Fabric supporting rest to T McLeud<br>Passing mill feeding attachment II lies  | 007 001  | Insole for bests and slews T J Re-   |
| trenshire<br>tabinet lace J II Adkins  | 968,002  | Pastiner P Hirsh   | DOM, 480<br>D. Ph. 240   | ting and sitting if T McLeed   |
| Cable currier apparatus G A America<br>Calendar W G Patropild  | 958 10n  | Pasteber inserting machine W ( Stewart Fasteber inserting machines born control  | D-8.040  | Inside of best and slove, parchi-  |
| ian capping machine F Belts tan thomas milk A R Ruppenthal   | 958 012  | ling mechanism for W C Stewart<br>Pestener puller T G Plant  | BON CERS   | lumining W II Houser P Tor   |
| I guid tabeum: O. II. Van Guilpon Candy wenteing and eleaning machine. W. F.   | 904,564  | Fast ting machine metalife M P Pictus<br>Past sings, machine for inserting us tallie   | to an emet   | Helt Combustion mater C. A &   |
| Walker<br>Causon, F J Blood  | 938,338<br>938,338   | T (I Plant   Whelan  | 954,293<br>968 710   | froming and deresing machine, T C  |
| tauras crus ster T G Hunt<br>Capping marbies cintel for I Bartlett   | 917 P.20   | Ford tog J II Kalers<br>Ford regulator L ( Roberts   | 958,611<br>938,314   | Jack for slugging and other machine  |
| Car, convertible how J. A. Andry Car coupling H. I. Heat. 859 LA   | 8.H 301  | France past 1 F France   | 938 619  | Julist W. Pence  |
| (ar coupling sporating skyles, R. P. Bush<br>(ar funder, ( P. Bronson  | 958,473  | File bandle T N. GHI   | 908.022  | Joint conditing lock J K Budger<br>  Kelr Butler & Pilek   |
| ter journal springing shield, and oil saves  | 955,134  | Fire engine pertable H II like   | 957 903  | Lamp, strobul-rapor A Rector   |
| (ar loader rallway hox It I Jackson<br>(ar sliding grain door F t Lakin  | 958, 140   | Fire holes closing device for cellar W C   | 000,000  | lamp and similar device electric tul   |
| tar spliced side genekla R. Otle<br>tar stip Laverty & Williams  | 958 426<br>958 657   | Firearm W H Sarder   | 931,332  | Lamp burner # How<br>Lamp carbureling Torchebouf & de  |
| tar which juck stand it thannesse ture distance spacing device for freight   | 958,864  | Pirrares repeating T t Johnson Pirrares partitions, manufacture of the   | 96A 407  | Lamp simir miner A & Neezan  |
| T tudey (are wage system for railway A (   | 954,368  | Movet  | B38 419  | Lamp metet esp etretrie (i W Gon   |
| (Tarke   | 957 937<br>955, 126  | Pish and gone bress R. B. Lee  | 966 142  | Lamp socket clockric & B Benjami   |
| Carboreter G & Cook  | 93A,476  | Picat, G Blank   | 938,541  | Lanteren, view dissolver for manie   |
|  | 938,326<br>908,827   | man Herondon   | 908 657  | Lap robe A G Frankeshoff   |
| log the teeth of, L. C. Schuckler<br>(and system J J Vossell   | 968, 13A   | Plour, hasking (' Herenderu S. 8 494,  | W18.493  | Last expansible foot, J. E Leavitt   |
| ing the feeth of h. C. Schuckler tard system J J Vogett tard system J J Vogett tarps fast ser stair C & kirsch tarries befor help before help to the control of the control |  | wheels for rotary A Huge of  | 934,120  | Lasting marking P R. Olass.  |
| ing the tretts of L. C. Schuckler log the tretts of L. C. Schuckler turn spates J. J. Vegett turns fast ser stair C. W. Misch turings baby h. Plourde tash register b. H. Tretilian tusing wron's combination W. L. Dann   | 937,018<br>937,018   |  | BW 105   | Lasting markins ford P Holbrook  |
| their retting to appearance for gardening the best for the fact of | 917,018<br>904,004<br>919 768  | Plant motor erack I I marriey  |  |  |
| their terrings and appeared for more access their states and a second states of their cases of their cases and a second states of their cases | 107,019<br>108,008<br>109,009<br>108,336<br>108,070  | Flushing tank E Kichman Fly serven V J Stratton Fly trap, K. B Anderson  | 918 MIZ<br>968, 208  | Leating markines, hold-down for  |
| the control of the co | 937,019<br>934,004<br>937,910<br>938,370<br>938,070<br>938,070   | Full motor clasts J I Ballicy blooking tank E Kichman Fly seven V J Reathya Fly trap, K. R Andream Franc Ser Dose and window france Frait sign; and grader G D. I arker  | 958 562<br>958,308<br>958,164  | Leating machines, hold-free for<br>Role<br>Leating machines, pincer mechanism i  |
| the strong the strong the strong the strong through the strong that we start of the strong that we strong strong to combinate on W. 1. The will a Duan taking strong to combinate on W. 1. Duan taking strong the strong that the strong t | 937,019<br>937,009<br>937,910<br>938,330<br>938,070<br>938,675<br>938,677<br>938,677   | Pilla Bolov etastk J I Barrey<br>Floading rath E Kichman<br>Fly serven V J Bracton<br>Fly trap, E. B Anderson<br>Frame for Door and window frame<br>Fruit signs and gender G D, I arkee<br>Furth signs and gender G D, I arkee<br>Farmer A Faster<br>Formers are fusion of the service of the | 958 562<br>958,208<br>958,164<br>957,873<br>938,120  | Leating machines, hold-down for<br>Bohr<br>Leating machines, placer mechanism i<br>ii Beely<br>Leating machines, placer or gripper   |
| the feeth of L. 1 when they care given by J. Vaged. I when they care given J. J. Vaged. I when they care given J. J. Vaged. I will be sufficient to the care given by J. Tree H. 1. Tree H. 1. The H. 1. Duan care to the care given by J. 1. Tree H. 1. Duan care to the care given by J. 1. Duan care given by J. 1. Duan care given by J. 1. Duan care given by J. Duan care given  | 937,019<br>937,919<br>937,919<br>938,079<br>938,075<br>938,677<br>978,998  | Fulls motor exects J manuary pushing tax of the pushing tax pushin                         | 958 842<br>968, 164<br>957, 873<br>958, 120<br>938, 420  | Lasting markines, hold-drive for Role   Lasting markines, placer merkanism if it for merkanism in the self self   Lasting markines, placer or gripper selem for T. E. finel   Lattin for end gatter of mining core   |
| and the state of t | 957,019<br>957,919<br>957,919<br>958,326<br>968,075<br>968,677<br>958,617<br>978,998<br>959,000<br>968,520<br>867,970  | Publis motor esect. I manny bushing tank B Richman Print Prais, R. R Andrean Print Para Poor and window frame Prais Boor and window frame Prais alor and grader G D, larker Parance A Puber Parance arch controlton, P lairs Parance arch controlton, P lairs Parance archives blast farture gnees, The Bart Review of the Control Parance gnees, Parances ignition arch for, W M Doncas Game A P Londy  | 938 562<br>958, 164<br>937, 872<br>938, 120<br>938 620<br>958 779<br>958, 258  | Lasting markines, hold-draw for<br>Bolt<br>Lasting markines, pincer mechanism<br>il Serigi market, and the series<br>Lasting market, and the gripper<br>Lasting or on guies of making dars<br>Bouwer<br>Late for one guies of making dars<br>laste mechanism for omergency   |
| The state of the s | UST, 019<br>USA, 004<br>BST 910<br>USA, 336<br>USA, 475<br>USA, 677<br>USA, 67   | russ motor search and manney Fly served V J Risathou Fly trug, R. B. Anderson Fly trug, R. B.   | 958 582<br>958, 164<br>957, 873<br>958, 120<br>958, 120<br>958, 759<br>958, 542<br>958, 542<br>958, 542  | Lasting markins, hold-farm for 1 Bolts Lasting machines, placer mechanism f 11 Berty Lasting machines, placer or gripper subm for my grite of mining cars Lasting machines, or machines, Later mechanism for emergency Later mechanism for emergency Later mechanism for split stocks and  |
| The state of the s | 1037,019<br>1037,019<br>1037,019<br>1038,139<br>1038,075<br>1038,075<br>1038,075<br>1038,011<br>1038,011<br>1038,011<br>1038,011<br>1038,011   | rind indice exect.  17 percent y 2 finethous  17 percent y 3 finethous  17 percent y 4 finethous  17 percent y 4 finethous  17 percent y 4 finethous  18 percent for Door and window frame  18 percent for board and window for finethous  18 percent for finethous for finethous  18 percent for finethous for finethous  18 percent for finethous  18                         | 958 587<br>958, 184<br>958, 184<br>957, 872<br>938, 120<br>938, 542<br>958, 342<br>958, 342<br>958, 363<br>958, 363                                      | Lasting markines, hold-drive for<br>Bolt modellier, phases merkarlism in<br>Bolt modellier, phases merkarlism in<br>Bolt modellier, phases or gripper<br>Lasting markines, phases or gripper<br>Latter for ever graves or making dors<br>tatch merkarlism for emergency<br>Aryan & Tyrio<br>Latter merkarlism for emergency<br>Aryan & Tyrio   |
| ming the devils of the six has been derived to the six of the six  | 957,019<br>957,919<br>957,919<br>958,076<br>958,077<br>958,677<br>958,677<br>958,577<br>958,579<br>957,970<br>958,011<br>958,011<br>958,011<br>958,011   | Cleaning the State of                         | 938 937 838 199<br>938 199<br>938 199<br>938 199<br>938 199<br>938 199<br>938 199<br>938 199<br>938 118<br>938 118                                       | Lasting markines, hold-drive for Role Role and Role particles, placer merhanism it Lasting markines, placer or gripper and anima for T. H. Heely Latting markines, placer or gripper Lattin for engines of mining derivative merhanism for emergency Arem of Trick animals of the property of the second state of the property |
| The state of the s | 037,019<br>107,019<br>107,019<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,075<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108,006<br>108 | rised store of the control of the co                         | 938 561 184 937 879 938 189 937 879 938 189 939 938 939 938 939 938 938 938 938 9  | Lesting unarhiere, hold-deres fro ; narhiere ; nature, pincer serentantes ; nature serentante |





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## The Latest a last Freight Engine. (Concluded from page 436) miles. On these divisions there is a heavy movement of freight traffic, con-stating mostly of loaded coal trains. The le conditions on this portion of the

road are severe and sharp, curves are numerous. Against northbound traffic in which direction practically all the movement of loaded freight trains takes place, there is a six mile grade of 1 % per cent from Carbondale to Forest City From the latter point to Ararat, the sum From the atterpoint to Arrat, the sum mit of the rise, a distance of 14 miles the road is on a grade averaging 0 %1 per cent. Going down the other side of the mountain, it is practically a continu ous grade of 51 7 feet per mile for 75 miles into Opeonte

Hitherto the freight traffic on this division has been handled by consolidation locomotives, having a theoretical maxi-mum tractive power of 49,680 pounds num tractive power of 49,000 pounds
A single orgine of this class can very
satisfactorily handle a 2600-ton train
from Ararat to Oneonta, but it requires
the assistance of two locomotives of the same class, as pushers, to hauf this load up the 20-mile grade to Ararat, at which

point the pushers cut loose
With a view to reducing the operating
expenses of the division and facilitating
the movement of trains, the officials of
the Delaware & Hudson Company decided to investigate the efficiency of the cided to investigate the emclancy of the Mailet type locometives for this service It was their aim to secure a pusher on gine of this type of sufficient power to move the maximum train load up the

move the maximum train used up to the hill with two engines instead of three in the fail of last year one of the heavy Mallet engines built by the American Loromotive Company for the Eris. Railroad was borrowed, and put into pusher service on the 20-mile Arast grade A number of test runs were made which proved that a single Eric Malitt engine easily did the work of two Malict engine easily did the work of two tives Following these tests the six Mal can Locomotive Company, and put into

These engines are of a straightforward design, embodying but slight modifica tions from the designs of previous loco-motives of this type of lesser weight and power constructed by these builders and power constructed by these builders With the boiler pressure of 220 pounds and driving wheels 51 inches in diameter, the theoretical maximum tractive power working compound calculated by the

company a formula is 105 000 pounds. As this formula which is applicable nly to articulated locomotives built by this company, is based on the results ob sined from a large number of indicat cars, taken under various service condi tions, it is found that the tractive power thus calculated represents very accurately the actual power that the locomo-tive can develop at a piston speed of not over 250 feet per minute
With the companys system of com

pounding the normal maximum tractive power working compound, can be in creased about 20 per cent by changing the engine into simple. The maximum tractive power of these engines working simple is thus 126 000 pounds

### New Two-Cycle Motors

(Continued from page 144)
compressed air which would then be fur
nished by chamber B to receiver D I is well understood that the high velocity produced by air under pressure is far more efficient in atomizing liquids than the comparatively low velocity produced by suction This type of engine should produce twice the power of a four-cycle engine of the same size and apeed, and we are informed that tests now made show this to be the case

Another engine using a differential pis ton but in an entirely different way is the Shortt Motor This engine com-presses air only in the crank case. Un like the others here described it does not admit this air through a port opened (Concluded on page 450)

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by the piston, but uses instead a valve which is vacuum actuated. The partial vacuum to operate this valve is formed above the larger differential piston F When this piston reaches the bottom of its stroke it uncovers a port G, through which air enters and breaks the vacuum, its stroke it uncovers a port G, through which air enters and breaks the vacuum whoreupon the valve instantly closes. The fuel is fed from a pressure tand through a needle valve, and is deliv inrough a nesure yarre, and in solve ered at the seat of the main inlet valve As the pressure in this tank is greater than that of the inrushing air from the crank case, it forces the fuel into the cylinde that the time the valve is open will vary with the speed of the engine so as to let in the right amount of fuel. The annuar chamber of the piston is used only ar canner of the pusion is used only to produce a partial vacuum which op-rates the main vaive. This engine should get sufficient air for clearing the cylinder on account of the enlarged pix-ton end and should be able to produce considerably more power than the usual wo-cycle motor

Prof S, P Thomas recently stated be fore the Royal Seciety that he had suc ceeded in producing a physiological effec-by means of magnetism. A coll of copper wire was made 9 inches in dia inches long, containing 32 turns rough this an alternating current of 50 cycles was passed, with a maximum flow of 180 amperes, giving 5,760 amp turns. In a dark room, when an obser placed his head in the mouth of the coll, he could see a faint bluish light, which was not steady but appeared to flictor considerably. This could be observed



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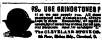
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me with the ever closed. When the en-liment was tried in broad daylight is the ever open, this fickering sens-in will permissed. The blue light, which is visible only in the dark, appeared to

How to Act in Case of Fire,

(Concluded from page 441)
fredging the part thickly with flour—if
the skin is not broken—and not disturbing it for some time.

Any vegetable oil-such as rest, or linseed-may be used with ad-niage, a rag being seaked with it and sed to cover the wound. A very good spiloation is made by mixing equal arts of linseed oil and time water, form-

geria of linased oil and time water, form-ting "carron oil."

Finally, it cannot be too strongly im-gressed that all clothing covering a burn hust be removed with the utmost care. Never try to withdraw the injured limb, but cut the clothing away—in small pieces, if necessary—so that the injured surface may not be more damaged Never hold a burn in front of the fire, never hold is burn in river to the an ecording to the popular practice, this only increases the injury. Have your oll or other application ready for immediate use as soon as the clothing has been removed.

Postencile's Theory of Comets, The idea of comparing comets to great glass lenses, which concentrate the suns giass leakes, which concentrate the same rays into luminous cones which appear as the cornels' talls, is so natural that its origin cannot be traced—it was indied by the philusopher Sensea, about commencement of the Christian era but it has been abandoned in accord ance with the example of Kepler, who after first embracing this doctrine with atter first embracing this doctrine with enthusiasm, renounced it on decovering that a large comet, which he had occa-sion to observe, possessed a curved tail. The impossibility of explaining this phe-nomenon, at a time when it was not known that light consumes a measurable time in traversing interplanetary anace time in traversing interpunerary space-caused Kepler to abandon the idea. The celebrated Fontenelle, regardless of the objection, took up and expounded the lenticular theory of camets in an ad-mirable manner in his "Plurality of Worlds." The coming of Halley a and several other comets has caused Wilfrid de Fonvicile to recall the attention of the de Pouvielle to recall the attention of the French Academy to Fontenelle's theory and the arguments which may be brought forward in its faror. At pres-ent, on the coast of every civilized coun try, phenomen similar to those to which Fontenelle attributed the forma tion of the tails of counts, are produced by the latterms of lighthouses. The dust which is suspended in the atmosphere is illuminated by the beam of light as Fontenelle supposed the cosmical dust to be illuminated by the concentrated beam of sunlight behind the lenticular comet. plains the individual poculiarities of comets, and is confirmed by observations made recently at the Paris and Greenrecently at the raris and Green-wich observatories For example, a di-vision of the tail is explained by assum-ing that the cloud of commical dust is not continuous, but intermittent, and the occasional sudden appearance of bright ts indicates the existence of a refecting body of considerable size. In a word, all the variations which are ob-served in meteoric showers might on this cory be expected to occur in the talls comets. The evidence of the spectro-ppe and the freaks of Morehouse's and of con omets are against this lenti

Engineers of the United States Geo-logical Survey estimate the annual dam-ses by floods in the United States at 150,005,000. If a too carry, perhaps, to states that the control of the Control States are to the Control of the Control States are to the Control of the Control States are to the Control of Francis, plon, and the Proops States of Francis, pany lead to practical wear that will serve aff 50 bytes Theorem's Empirical



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## HALLEY AND HIS COMET

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AT last the fixed guide, the result of 20 years of study and travel, as completed if to ended to years of study and travel, as completed if to endowed by every steam, the study of the stu



Bristol's Recording Thermometers



hs 1900 for ALL Resolve, 27 Opinios World's record for endurance (and Salvet Trophy Cup), won by Yale Team (3), July, 1979, 600 miles acregang 20 miles per louri, a petricet worter- no adjointnents—and gason. The Yale had personally won R. A. M. Endurance Contests for four years. Non stop engues test, January 24 to 29, 132 hours indoors, without fan or any other cooling device. Eugene was then stopped and machine govern a vigorous road test performance).

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The Yale Twin Cylinder, 61/2 IL. P. \$300
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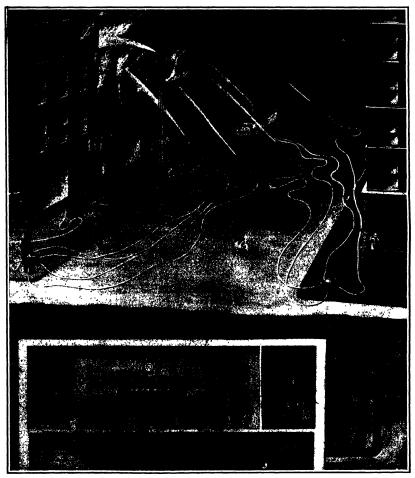


A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

WASLESHED 1845.

NEW YORK, JUNE 4, 1910.

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Notice of a fire comme to the operator at indephone (see view of pumping station), who instructs employ row to pumping station), who instructs employ row to pumping station which draw water to be compared to the product of the state of the

### SCIENTIFIC AMERICAN ESTABLISHED 1843

MUNN & CO , Inc.,

## Published Weekly at No. 361 Broadway, New York

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NEW YORK SATURDAY, JUNE 116, 1940

The follow is always stal to revely for examination illustrated articles as always and timely interest. If the photographs are sleep, the articles about and the factor authorities the contributions will recurve spanish to

### WHAT WILL THE BAISING OF THE "MAINE" DISCLOSE 1

HIE action of Congress in passing a bill mak ing a preliminary appropriation for the work of rolsing the wreck of the Maine" is, for several reasons highly commendable. Chief these is the opportunity which will be afforded to give decent burial in the national cemetery at Arlto the bodies of the unfortunate men, who we carried down in the wreck of the ship, and have re alned entombed for the past twelve years. Look at it whatever way we will the fact that no effort has been made to recover these bedies carries with it seertain uncomfortable sapect of neglect, and the na tion owes it to the memory of the dead, to the sensi bilities of their surviving relatives, and lastly to its own dignity and self-respect, to recover what may be left of the mortal part of these brave scamen, and give them decent interment with proper military

Second only in importance to the above considers second only in importance to the move considers thous are those which affect the sensibilities, and par ticularly the some of honor, of a European power with whom we are at present and hope ever to be, on terms of friendly understanding for it is a fact that terms of releady understanding for it is a fact that the Spanish government fit is very keeply the implication that the destruction of the "Malne" was brought about 19 Spanish against—an implication which, though not expressed, yet in economic followed from the indusp of our Naval Insert of Inquiry, with a concluded that the Malnes was destroyed not from within, but from Walnes in the opinion of the Court, and the report, this order could have been produced to the country of the co bottom of the ship at about frame 18 and somewhat the port side of the ship

Now, although our Navy Department did not then and does not now, believe that the Spanish officials were in any way concerned in the disaster, attributing the explosion to the hatred of fanatics it is doubt ful if this opinion was shared, or is even yet held, by the majority of people in the United States.

Therefore the raising of the "Maine will be well worth all the trouble and cost it will entail, if the thorough physical examination of the wreck which can then be mude, brings to light clear evidence that can not be many, rungs to ignat over extreme tract the explosion was due to internal causes, that is to say, to the spontaneous and therefore accidental rom buston of the explosives contained in the forward magazines This latter was the explanation offered by the Spanish Naval Itoard which examined the wavek at the time of the disaster, and it is significant that it received credence not only among naval experts abroad, and especially those of England, whose atti-tude was markedly friendly at the time but alar among not a small percentage of the officers of our

OWN DELY It would be a "consummation descutly to be wished if the raising of the wreck should afford am ple cyldence or even a strong presumption, that the 'Maine' was wrecked by spontaneous explosion in the magazines. Such a conclusion would cast no discredit hatever upon the officers and men who had charge of the "Maine" on that fatal night, for it is well under-stood and has been proved by arcidents such as that which occurred on the French battleshin "Jens that which occurred on the French battleshin "Jens that under the conditions in which powder was stored at that period and for some years later it was possible for spontaneous combustion to have taken place in spite of that attrict observance of regulations, which ence before the Board showed to have been foliowed on the "Maine

Now, if this occurred, the tearing assunder of the retective deck and the blowing out of the sides of

the vessel, accompanied by the instant flooding of the portion of the ship forward of the explosion, would ave caused the weight of the ram bow, the anchor and anchor chains, to bend the forward portion down until the ram was hanging vertically below the ward until the rate was nanging vertically constituted while, held thereto only by the floor and keel plates. Then, as the main portion of the ship filled and sank, the bottom of the ship would naturally be folded down vertically against litest; leaving the keel and the double bottom in that peculiar, inverted V position, which gives it the appearance of having been blown up by some powerful force acting from below

When the cofferdam has been built entirely around the wreck and the water pumped out, it will be possi-ble, in all probability, by a careful examination of the srecked atructure, to determine how far this theory is correct. If it be proved there will be cause for gen-cral congratulation. With that awful tragedy trans-ferred to the category of unpreventable accidents, a proud nation with whom we are in friendly relation-ship will be sindicated from a charge which even today is a source of resentment that is none the less real because it is unexpressed

### REVIVAL OF THE ROTARY ENGINE

N the introductory article of a series dealing with the rotary engine which was published in the year 1897 in the Suriginary (Vol. 2011), Nos. 1109, 1110 1111), we said "The constant failure that has attended the efforts to produce a successful tolary engine, and the fact that the direct acting tolary engine, and the fact that the direct scring strank and rod, reciprocating engine has retained full possession of the field, have led many people to sup-pose that the rotary engine inventor is as visionary a dreamer as the would be inventor of perpetual motion As a matter of fact, however, many of the objects aimed at in the first device are as legitimate and useful as these of the latter are alsurd and im-possible. While the supposed advantages of a rotary confine as outlined below, have proved very attract tive to the inventor, the results of careful compara tive tests have shown that except in the case of ro tary impact engines or steam turbines, the rotary on gine does not compare in efficiency with the ordinary reciprocating type Now it would certainly m that with such theoretical and practical mechanical features in its favor, the rotary engine would prove a formidable rival to the standard type. But this it has never done, and for the very practical reason that owing to its peculiarities of construction, it is difficult to secure an economical regulation of the steem supply, and it is impossible to keep the joints steem tight and prevent irregular wear of the parts The wear of the piston is always greatest at the cir-cumference of the cylinder, decreasing toward the cen ter, and this structural defect has thus far baffled the efforts of the mechanic. The packing devices that bear against the circumference of the cylinder, like the piston bear of a vertical directs ting engine show an equal wear throughout but no amount of ingenuity has yet acceeded in compensating the variable wear of the side parking. There is a further difficulty in the fact that in rotary engines that have nly one admission port the steam pressure produ a rapid side wear on the shaft, and renders it diffi a rapid side wear on the sharf, and renders it dim cult to keep the stuffing hox steam tight. Another diffi-culty is experienced with the valve gear, which in the great majority of rotary engines is of the recipro-cating type. Reciprocations which would involve no (Attng type receiptorations winth would interest as a moderate speed become serious at the enormous speed of the rotary engine, and produce rapid wear of the paris"

was the situation in the rotary engine fi about a dozen years ago. The difficulties were of a purely mechanical kind, for the theoretical advan-tages of the type were highly attractive and never dis-We remember anking the late George M kins, a mechanical engineer of exceptional construct-ive ability, who had devoted a large amount of effort to the problem what he thought were the prospects for the production of a successful motor of this type ite expressed the opinion that the large steam leak age, due to the impossibility of making successful frictional joints coupled with the heavy frictional losses, to say nothing of the rapid wearing out of the iosses, to say nothing of the rapid wearing out of the re-proceeding valve movements had convinced him that no successful rotary could be built. As the matter then stood, it was evident that a ro-tary engine, to be successful must be absolutely rotary

in all its parts and free from any reciprocating move-ments whatsoever, that the rubbing surfaces much be reduced to a minimum, if not altogether eliminated, that steam leakage must be greatly reduced; and that some mechanical means must be found for eliminat some mechanical means must be found for eliminating the unsern wars on the main bearings due to the occasific application of the load. In the Intervention wars, in selts of apparently insuperable difficulties investors have struggled with the problems with that indominable proversame. which is no frequently has calculated of their work, with the result that at last a rotary engine of twenty home-power has been dwarf-ord, which has shown its ability to perform steady ord. shop duty, day as, and day out. To a partial income, without she'cits, way, signs of each age. Relevance to make here to the, encededingly assumed to the makes of an illustrated strict on another, which she then makes of an illustrated strict on another, which she the makes of an illustrated strict on another, which she the makes of an illustrated strict on another, which she is the makes of an illustrated strict on another, which is the strict of the makes with the success has been schwind by an ing those very conditions of a mechanical may which the experimental work of the past band years had shown to be essential to a votary onall first contain the strict of the strict which is the strict of the strict years and shows to be essential in a yeary can The tests at Essevan insultate and at the contract plant speak for themselves. It remains for the fut to determine how far the rotary will succeed in new field of high-pressure, superheated sitem, which, theoretically, it would seem to be admirst

Tout 2

### THE COVERNMENT AND THE INVESTOR.

HE Committee on Patenta has under consideration a bill introduced by Mr Currier, the purpose of which is to enlarge the juris may entertain suits against the United States for the infringement or unauthorised use of a patented invition in certain cases, and award reasonable compen tion to the patentee

The measure is necessary, when it is considered that under the English common law, which prevails in this country as well as in England, a sovereign power cannot be used without its own consent. The United States has established a regular tribunal, and it with the duties of a regular trouban, and canalities the gen-ernment but the scope of its duties does not include the adjudication of an inventor's rights when his in-vention has been appropriated by his government. When the government issues a patent, it does not grant a favor to the inventor, but it "scoutse him a

grain a favor to the inventor, but it "scource him a right," in the language of the Court in U S. vs. Palmer 1128 U S 271), and this securing of a right by no possible implication carries with it the opposite power of destroying the right in whole or in part by appro-priating it to the purposes of government without com-plying with that other condition of the Constitution,

the making of "just compensation"

For all that many inventors have spent years of their lives and practically bankrupted themselves in developing inventions primarily of use to the govern-ment only to find in the end that their property has been practically confinented that they have no legs means of redress, and that the governmental depart means of redress, and that the governmental separt ments will not recognize the decisions of the courts to doubt the government has the right to appropri ale an invention necessary for the preservation of the national defense yet appropriation having been made.

national defense yet appropriation having been made, it would seem that some compensation should be paid. Despite the devisions of the Supresse Court, despite the fifth amendment to the Constitution, which pro-vides that no private property shall be taken for pub-lie use without compensation the government again and again axisse private property, in the form of pairent rigats, without compensation face Court of Claims now has no jurisdiction to award compensa tion for the governmental use of a patent, except when such use is under a contract. To extend the jurisdic-tion of the Court so that it may entertain suits and award compensation to the owners of patents in cas where the use of the invention by the United States government is unauthorized, is the purpose of Mr Currier's bill

Currier's bill
A similar measure was introduced by Congressman
Dalkell in the closing days of the last Congress The
measure passed both the Ilouse and the Senate but
If was not signed by the President. Mr Currier's bill
is practically the same as Mr Dalkell's with the exception that certain patents taken out by government officers or employees, which are good against all the world, are not good against the government. This is as it should be; for when a government officer is as signed to the task of devising an implement, and the government bears the expense incidental to the inva-tion, and the officer continues to draw his salary in the meantime, it is evident that the government is the implied owner or at least licensee of the inves

implied owner or at jesse Honnese of the investion.

The experimental resistanches into the effect of electricity upon fog commenced by Sir Oliver Lodge in the Control of There is a proposal to conduct à stiullar experiment under RP Cilter Ladgar direction and on a more self-tentive scale in London, somewhere is the neighborhood of Finançaires Bridga, where it is hoppid a choise. And the self-time conduction are self-time and the self-time conduction and the self-time and the self-time conduction and the self-time and the self-time conduction in the passes, and as required to make this installation to the passes, and as required to so not clear how the rising set for its self-time conduction and the 
### ENGINEERING.

# (iii) is claimed by the contractors that a new record fee American shart sharing has been accomplished on the Moodan siphon of the New York city Carsill squedots, where a shart 16 feet 5 inches in diameter was punk 177 feet in thirty-one days. The work was done in hard Hudson River shale

In a recent government test over the measured mile source off Rookland, the new battleship "Michlgam" covered the fastest mile out of twenty successive "runs at a speed of 19 54 knots, which exceeds by 'more than haif a knot the fastest mile made at the builders' acceptance standardization trail.

The first of three concrete barges which will be used the bydraulic operation at the Panama Canal proposity is another in the proposity is a complete with creding pump, motor, and equipment, three feet nine tiphese One-quarter-linch No 12 wire mesh has been fined in the wall construction The behavior of these larges will be watched with great interest

The Interstate Commerce Commission has recently faled that, hereafter, on several railways in the Northwest, the upper berths in Pellman siesping cars are to cost less than the lower borths. The Commission states that, in the past eleven years, the Puliman company has doubled its capitalisation and dividends without the investment of any new capital.

The latest report of work on the New York Sittals barge canal shows that this great undertaking barge can shows that the great undertaking the state of the total work is under contract, additional plans have been completed for 48 2 miles, additional plans have been completed for 48 2 miles, additional plans have been completed, the state of 
With a view to determining whether or not the new type of salely will be deficied when striking at an angle, or whether they will bite into the plate, several of the new soft mosed naval shells were fixed nonlational purposes to the same that the same transfer strikens from the navy list, and consigned to the strikens from the navy list, and consigned to the cloted by the latest 12 inch armor plate, in actions arranged on the vessel at welculus angles

As eyeber made by the American Vanadium Com pany was recently tested to destruction by the Ameri can Bridge Company. The test bars, which were of vanadium nickel steel, measured is inches by 2 inches by 35 feet. The results showed an elastic limit of 95.840 pounds, and a testellis terraght of 95.950 pounds per square inch, with an elongation of 35 per cent in 11 inches, and a reduction in area at fracture of \$2.5 per cent. Part of the bar was bont cold under a \$4.000-ten press, and fattered unon inself without sign obstacle, this will be an ideal material for the eyelant of long-staps bridges.

Efficiency tests are conducted by officials of the Pennsylvania Railroad, who, at unusual times and pinces, sot signals of caution or danger, deplay function or place torpodes on the track, with a view to keeping all employees constantly on the alert for signals. During the tests for 1959, the following records were made by the men Block signal rules, 47,384, of which was present to the militorial process of the part of the employees, 45,387 tests of rules governing flag men, use of Tuests, torpectors, and other signals, 97 emm, use of Tuests, torpectors, and other signals, 98 emmilioned to the part of the employees.

Acting is accordance with the Spooner act of June 28th, 1959, which states that "the President shall cause to be constructed such and and commodious harbors at the terminal of the Panama Canal, and make such provisions for their defense, as may be necessary for the safety and protection of said canals and harbors." Only 100 to the same protection of said canals and harbors. The safety and protection of said canals and harbors. The safety said canals are said to the safety of the safety and the same content of saids for first the same moments of saids for first the same moments of saids for first the same said of the same said to said the said of the same said that the same said that said the said that said the same said that said that said the same same said that said the said tha

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## Scientific American

In his presidential address before the American Electro-Chemical Society at Pittiburg, Dr. Loo H Beakland stated that "the last hundred years, under the indisease of the modern engineer and scientist, and done more for the betterment of the race than all the art, all the criticing efforts, all the so-called interest of past ages, for which some respectable people want us to have such an example of revenue."

The thirty-third convention of the National Electric Light Association, which net at 81. Louis last week, reported a very prosperous year, in which \$250 men bers were added, bringing the total membership up to \$470 The association began in 1885, with a membership of only 11 There are \$250 operating companies represented in the association, and these constitute of the property of the control of the control tight indutry in this countribusion of the control tight indutry in this countribusion of the control tight indutry in this countribusion of the control tight.

A new form of mercury-rod interrupter has been developed, with the object of producting a sharper break. It consists in covering the mercury with a quenching iquid As the rod is withdrawn from the mercury, a bubble of vapor from the quanching iquid forms on the end of the rod and tends to presult harvery level suddenly downward at the break, thus effecting a more perfect current interruption, even though the rod may rise comparatively slowly from

The New York Lagistature has passed the bill which places is idepayab and telephone companies of the Statumber the supervision of the Public Service Commission for the second district The bill empowers the Commission to investigate and regulate the rates and service. The companies are required to file sucreports, and the Commission may vote any privilege under the franchises of the companies which have not as yet been exercised. Reduced rates, passes, or franks for the transmission of messages are prohibited

A novel ventilating system has recently been developed, which consists of a small electric fac connected to the window still in such manner that it may be operated either to draw in air from the outside or to estatast the air from a room. It is suggested that the value of this will be appreciated in a kitchen on ironing day, or when any baking is being done, as it prevents the best from spreading through the units more, besidee making the kitchen itself more connected to the contract of the stilled of the stilled of the stilled on the stilled of the still

In order to determine the heat generated by concete when hardening, at thermometers of special con struction are to be imbedded in the concrete walls not feet and to be for the Panama Canal Each thread cell Table is connected by a pair of lead-sheathed copper wires to an indicating instrument; and a small storage battery Variations in the tensel" turn of the cell product what the tensel with the cell product that the cell product with the cell product that the cell product was the cell product to the

Il is a difficult matter to measure very light ten since of electrotatic or Winnburrt machines, owing to the glow discharge which is agt to occur above 40,000 voits. A new method has been adopted by Prof C F Guye and Mr A. Techerolavski, which was recently submitted to the French Academy of Sciences This constate in inclosing the spart gan and the electrometer in a substantial box, in which compressed gas is introduced According to the Faschon law, the distribution of the spart gan can be approached disruptive potential is approximately proportional to the gas pressure. Thus, with a given potential difference, the electrosic of the spart gan can be approached growth of the spart of the spart gan can be approached pressure, and by this shorter gap the electrosistic freeds are reinforced, insuring more accurate residing. This method has been employed in measuring the stasion of a Winnshuyut machine, which showed a voltage of 80,000 with a pressure of from 4 to 9 atmospheres in the inclosing box.

Last November there was a series of heavy snages to various to Germany, which dis considerable damage to evarious disleptones and telegraph lines As a result, a careful lavestigation was made of the question of putting such lines underground, and it was found that by using the Pupin system, underground cables could be used to good advantage on lines of less than do miles in leutit, with wires not more than three millimeters (0.118 inch in dâmster. The advantage of the underground events were found to be as forest of the underground events were found to be an other of cross tall, that there would be no interruptions due to extral causes, that there would be no denser of cross tall, that the efficiency of the line would stury be pussed for roading, due to extraval causes, that there would be no denser of cross tall, that the efficiency of the line would stury be pussed for roading, due to extraval causes, and that while laying the cables extra wires could be provided, which would pormit to further expansion to meet designation that the same cables with spik dispans, of input disarrance.

### SCIENCE

Mr. Charles M. Peck, botanist of the State of New York, in his annual report states that the known species of edible mushrooms in New York amounts to 200 Five new kinds of edible mushrooms were discovered in the last year

Dr. Gharles Forbes, of the Department of Physics in Columbia University, has installed in Bernard College the first permanent apparatus for the installation of the Foucault experiment, to show the motion of the earth Dr. Forbes set up a temporary apparatus for the experiment in St. Paul's Chapel of Columbia University some two years ago, which was described in

Dr. William Philips Blake, a member of the first class ever graduated from the Benfield scientific School of Yalo, and recent the Benfield scientific School of Yalo, and recent the Benfield Chilipsian scotty after he had received the Genfield Chilipsian the University of California. Prof Blake was 8 to your old When he graduated from Yale in 18th, became the geologist and mineralogist from the United States Preiffs Railroad expedition. His numerous activities included the editing of the Mining Magazine, sequelogical work for the Japanese government, the sx ploration of a section of Alaska, the teaching of mining along and geologist of the College of California, along and geologist of California, and the teaching of section of the University of Arisons.

The satisfactory examination of the absorption spectra of glass of various sorts requires, in addition to the thermopile, a spectrometer with glass or quartz lenses and prisms, and the exact determination of the wave length of the limit of transparency requires the use of a alit with very sharp edges a camera with an excellent lens, and a source of light the spectrum of which contains many sharply-defined lines and ex tends far into the ultra violet. The spectra bitherio employed for this purpose including the spark specof an alloy of cadmium, zinc, and lead, the trum of mercury, obtained by means of the vacuum tube or the electric arc, the spectrum of the carbon arc and even that of the Heraeus amalgam lamp (mercury, lead bismuth, sinc, and cadmium), con tain too few lines to give satisfactory results. Zick endraht has recently employed the arc spectrum of iron, which, because of its extraordinarily large number of lines of accurately known wave length, appears ell adapted for the study of absorpti A Zeiss spectrometer with quartz lenses and The results, which are published in tabular form, are too complex to be briefly described.

of. Haber claims to have solved the problem of the direct synthesis of ammonia from its elements nitrogen and hydrogen The process has been pur chased by the well known German establishment, the Badische Anilin und Soda-Fabrik If the process is as practical and economical as its inventor claims its duction will quickly cause a revolution in a paratively new but already important branch of in dustry, the manufacture of artificial nitrates in several countries possessed of abundant water power, large nitrate factories in which oxygen and nitrogen are combined directly by means of the electric arc, are in operation Prof Haber gives a few details con-cerning his process, but states that the combination of hydrogen and nitrogen is effected at a temperature of about 1,000 deg F and a pressure of 200 atmos-pheres. In a recent lecture be exhibited an experi tal apparatus which produced three our The presence of a cataliquid ammonia per hour lyser is required to accelerate the combination. For this purpose, Prof. Haber employs uranium, but the rarity of this element appears incompatible with its employment on a con mercial scale

The adulteration of food in France is said to result in a profit of one hundred million dollars per year Bread, which may be called the national food of France, has long been adulterated largely with tale, a substance which is not only indigestible, but is credingly irritating to the gastro-intestinal mucous membrane bocause of the sharp crystal fragments which it contains. Flour is often mixed with alone or with polassium exchange to the same which it contains. Flour is often mixed with alone or with polassium channels to increase the same bread fresh with copper substate and ammonium carbonate, to disnisish the quantity of yeast required and to improve the appearance of bread made with spoiled four Denatured sicolol, cesting one-sighth the price of pure airobol, is used for the manufacture of the liqueurs and ospi-sitis, which are no largely consumed in France Alciohol, denatured by the addition of methyl sicohol, is mixed with an equal void and rain, which have the effect of precipitating the methyl alcohol no completely that its flavor remains harely perceptible. The mixture is then brought to the destroed alcoholic strength by the addition of strong spirits, favored to suit the baset of the consumer and sharpened by the addition of a pint of nitrie and beauth largers.

## A COMMERCIAL ROTARY ENGIN

PRACTICAL SOLUTION OF AN AGE-LONG PROBLEM

Elsewhere in this issue we have discusthe problem of the rotary engine and set down the mechanical difficulties which must be mastered before a successful engine of this type can be produced. Reference was made to the fact that a recent rotary engine has undergone a successful laboratory test at the Stevens Institute and a successful commercial test of six months' duration at the plant of a leading tiest or six months duration at the plant of a leasing contractor in this city. This engine, which was de-signed and built by Mr Gerardus P Herrick, of 74 Broadway, this city, forms the subject of the accompanying illustrations. The principal distinguishing features—those which contribute more than any oth-ers to its success—are, first, the fact that reciprocating movements are entirely eliminated, all of the movements being rotary and secondly, that the main shaft of the engine runs upon a film of steam, whereby the destructive thrust, transverse to the axis, is completely counterbalanced

MERIANNAL PRATURES rotors or drums of equal diameter, placed one above the other, and running with the barest clearance beiween their peripheries By means of external gears, they are caused to rotate in opposite directions at the same speed The upper drum rotates within a closed cylindrical casing, between the walls of which and itself there is a bare micrometer clearance. The lower, or what we might call the power drum, rotates within a casing of larger diameter than itself, and it is provided with a rectangular piston which fills the annular space between the external periphery of the drum and the internal periphery of the casing. This drum and its attached piston also rotate within their casing with only a micrometer clearance between the adjacont surfaces. The peripheries of the upper and lower casings intersect each other sufficiently to allow the upper drum to project within the lower casing until if rotates with only the slightest clearance between

if rotates with only the slightest clearance between itself and the power drum

VAIVY MEDITATIONS—Sunk in the upper drum is a transverse, semicircular recess, which serves at once as a pocket to admit the platon of the lower drum as the two drams roll together, and also as an admission valve for the live steam, the proper registering of th piston with this pocket being assured by the fact that the two drums are geared together. Steam is admit-ted on one side of the engine and exhausted on the ted on one side of the engine and expansion, and ex-haustion of the steam are simple and easy to under-stand. As the piston (which, viewed from the side of the engine shown in our drawing, moves opposite to the hands of the clock) clears the pocket in the upper drum the latter moves forward until its les wire clears the lower edge of the steam inlet when live steam is admitted to the annular space be the piston and continues to flow therein until the

after edge of the pocket has swung round clear of the steam cylinder This point of cut-off is the popoint of cut-off is the po-sition chosen for the ac-companying illustration. During the rest of the stroke, the steam works expansively, until the after face of the piston clears forward rdge of the exhaust ports, which are shown in dotted lines at end of the circular noth swept through by the

STRAM COUNTERBALANCE The most original and valuable feature of this on gine is the ingenious meth-od by which the heavy load on the main shaft, due to the radial steam pressure in the cylinder, exactly counterby by a steam pressure acting the opposite direction the rotor being balanced in its own steam. This is accomplished by means of what are know ancing plugs, which are

anching plums, which are insteaded instannial natural chambers. There are two of these plums, one on each side of the engine. They are made of sufficient length and diameter to provide an area which, at any part of the stroke, is exactly equal to the area of the manufacture of the drum which is under the presente of the drum which is under the presente of the lets stome. For a little over half their periphery, and on the side immediately opposed to that portion of

the annular cylinder space upon which the heaviest steam pressure is developed, the belance plugs are provided with a saries of recessed steam pockets, and steam is admitted to these pockets successively by a series of holes drilled through the drum.



The piston is shown at out-off. Note small boles back of to printit steam to belending chambers Rotary engine with side plates removed



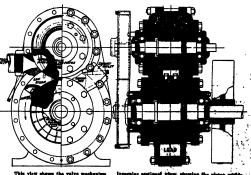
By this device the roter rides on a film of sta is taken off the main bearing The balancing plug.

journals prevented, but it is possible to showed the rotor on finely adjusted half-bearings, whose city; it sainsty to heavy the vector in true axial adjustment and the property of the rotor of the saint adjustment which has contributed to grain the saint and rotors bearing the rotor of the saint and rotors bearing by mechanism the saint saint and rotors bearing by mechanism the saint saint saint and rotors bearing by mechanism the saint fully that they could be seen accessed with the seen accessed micrometer elegantary in proved by the fact that is the tests at Stevens Institute, this engine developed him a steam consumption of 60F brake horse-power en a steam consumption of i points per brake here-power per hour; which only perms Invership with the steam consumption of the average reciprocating engine of similar capsority. It will be realised that by getting rid of packing devices and introducing a system of seam balancing. Mr. Herrick has not only prolonged the life of the rotary engine, but he has greatly increased its sutget by get-ing rid of that accountanted riction which, in serilar forms of the rotary, was sufficient to cut down the economy to a point which readered them commen-erations.

LANGEATORY TESTS.--In his report of the lab Lanaurous Therm.—In his report of the laborators thesis at Stewars institute, Pro Proyr states that the obtained the following results With a steam pressure of 145 pounds and 1,000 revolutions per minute, 20 48 brake horse-power was obtained with saterate steam, on a communition of 507 pounds of water per brake horse-power per hour With a steam pressure of 1855 pounds and 55 deg of superheat, the engine at 1,008 revolutions per minute developed 20 40 brake as 1,000 revolutions per minute cavelopes 20 40 brake horse-power on a consumption of 44 pounds of water per hour in commenting upon these tasts, Prof Pryor says of the engine "Its steadiness of operation, its lack of wibration, and its output per cubic toot of space occupied, should be particularly com-

menned
COMMERCIAL TENT—To test its commercial value
over a long period of time, the engine was coupled to
a dynamo at the Degnon Contracting Company's plant
in this city, and from August 14(th to December 11st,
1908, it served to produce the current for lighting the plant day and night. It was run for 1,685 hours, or the equivalent of more than six full working months. At the end of this time, it was again tested at the Stevens Institute; when, under similar conditions of revolution and steam pressure to those which obtained at the first test, the steam consumption was found to be 52 6 nounds, the slight increase being attributed by Prof Pryor to the fact that new ball bearings had been put in without sufficiently careful adjustment

> FUTURE FINED OF THE ROTARY —Apart from the field of usefulness open for the rotary because of its compactness, sim-plicity, perfect balance, and moderate steam conand moverate steam con-sumption, there is a far wider and more important field presented in connec-tion with the steam tur-bine. We have frequently in this journal drawn atsoon to the rect that the sum turbine is most clent in the lower uses of the expansion of steam; and that in the the steam; and that in the higher ranges, because of Sakings over the chde of the hindes, it is not as accommunat; and that at the special state of the highest it is decidedly speconomical. For it is related to the seconomical state of the secono



A PRACTICAL COMMENDIAL BOTARY REGION.

ly, the thrust of the steam toward the shalt of the 17, the throat of the steam toward the shart of the rotor as, for all positions, constantly halfaroned by an equal threat of the steam away from the shaft. For-fer balance is secured, the rotor predeficilly running upon a fine film of tive steam. The principle running upon a fine film of tive steam. The principles of the improvious arrangement are that, not day to the friction and destructive, queries was at the length

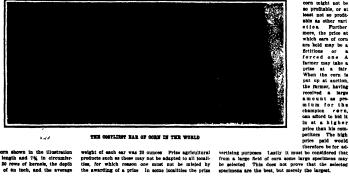
pressure and superheat, and this to L. D Levestin, the skiel engineer

## ONE 4 3010

## THE COSTLIEST EAR OF CORN IN THE WORLD

BY FRANK C. PERKINS

In the accomplaying lituatra-tion we present ten shampion ears of sorm, which were said at the rate of \$2.545 per bushel, \$5 \$255 for the ten ne of the tor



ever paid for a single early for a single ear of corn. The obsamplos tan ears of corn shown in the illustration average 194 inches in length and 7% in dreumers cases, each ear caverying 30 revew of hernest, the depth of the keraels being % of an inch, and the average

corn might not be so profitable, or at least not so profit-able as other vari eties. Further more, the price at which ears of corn are hold may be a fictitious or a forced one A farmer may take a prize at a fair When the corn is put up at auction, the farmer, having received a large amount as pre-mium for the champion cern, can afford to bid it

## GIANT RUHMKORFF COIL

BY JACQUES BOYER

The first induction coil was made by Masson and Brigues in 1843, but it was not until 1851 that Ruhm korff gare the instrument its definite form, which has not sensibly varied since that time, although it has been improved and modified for various applica-tions. Ruhmkorff increased the number of turns of

These wires are magnetised by the primary our-rent and the mag-netic flux produces currents in the secondary cir-

The principal The principal improvements on the which have been made in Ruhm-hoffs original online the fellowing. In the first place, Fix-esu, increased the it place, Fig., increased the ner of the in-timent by om-ting the ends the primary.

the other This method avoids the production, between two adjacent turns of wire, of a difference of potential sufficiently great to pierce the intervening insula-

tion.

The interrupter, by which the primary circuit is broken at very short Retervals, was improved by Ducretet, by giving it the form of a vibrating strip of metal, and about needs and bearing at its middle point a

induction coils are usually provided with Foucault's mercury interrupter, operated by a separate battery of one or two cells.

of one or two cells.

One of the largest induction cells ever made was
constructed long ago in England for Spotitwoods, bythe instrument maker Apps. Its length was 46 inches,
its external diameter, 18½ inches, its total weight,
1,875 pounds, and the weight of its core of sort inches

From the core of th

feet of wire of a feet of wire of a diameter of 1/10 inch. The length of the secondary circuit was 280 miles. It consist turns of wire. operated by 30 Grove cells, pro-duced a spark 40

inches long

A still larger
soil was recently
constructed in Paris by Carpen tier The second ary circuit of this instrument is miles of copper wire of a diam eter of 1/125 inch The soft iron core has a length of 80 length of 80 tional area of 9.2 square inches The primary coll contains 792 turns of cop ribbon, about inch broad and 1/25 inch thick arranged in six is surrounded by



A GIAST RVERESRY COLL

plais of settlers, closed fews tries this set.

The primary current flows through the format of security of the primary current flows through the format of security of the security of the format of the security of secu

an eboulte tube more than ½ inch thick. This giant induction coil, operated by a current of 110 volts and 30 amperes, produces a spark about 50 inches in length.

The Canadian Government have appropriated \$50,zne Canadian Loveriment have appropriated \$50,000 for experiments in electrical amelting, which are to be conducted under the supervision of Dr Rugene Hannal, superintendent of mines for the Government of Ottawa.

### FIRE PLEATURE WITHOUT PIRE EMPIRES.

The practical elimination of the fire engine from fire fighting in the business section of lower Manhattan has been brought about by the successful use of the has been brought about by the successful use of the high pressure independent fire service Good results have attended also this modern magind in Brooklyn, Concy island and Philadelphia, and in all of these places independent systems of high-successory mains supplied from central pumping stations now are es-sential and established elements in much needed fire The frontispiece of this week's Scientific AMERICAN Illustrates the method and its application by the firemen, and while it is not intended to repre sent any particular plant, yet it shows the es features of a modern high pressure pumping station with motor-driven pumps and the use of the hydrants along the distribution system, such as are employed in New York city

Now if a press re of water at the hydrant can be maintained as great as that furnished by the num then the latter of course is sug cus, and that, along with adequate water supply, is cus, and that, along with adequate water supply, is what, in short, the high pressure system accomplishes. This condition however, so successfully realized, has been made possible only by modern mechanical and electrical engineering, to which the firemen have added electrical engineering, to which the firmen have added by intelligently studying and applying the new re-sources at their command. Reterring to our illustra-tion, it will be seen that the pumping attain has two sets of intakes for its water supply—one for fresh water and the other, which is also consection which water and the other, which is also consection which water and the other, which is also consection with a vacuum pump, for sait water In the case of the New York system, the Cyotion water is used under all nor-mal conditions, and the mains are kept filled at the cordinary (try pressure The deritt on the city's sup-ordinary (try pressure The deritt on the city's supply for fire purposes compared with the usual daily motion are inconsequential, but the river or consumption are inconsequential, but the river or salt water may be drawn at any time through intakes extending direct to the pier slips, and is available in case of any failure in the fresh water supply or at a time of a large conflagration. For high pressur-stations either gas or electric motors are available to drive the pumps, as there is always a supply of this kind of power from public service corporations disgind or power from public service corporations dis-tributed underground, and carefully protected and du-plicated in such a way as to make any possible failure highly improbable. Thus in the Manhattan pumping stations the high-efficiency centrifugal pumps are driven by induction motors using alternating current driven by induction motors using atternating current from the Belison Electric Company, with direct con-nection with its Waterside station and duplicate con-nection with its substations, provision even boing made to connect with Brooklyn in case of emergency A contract between the city and the company requires a constant reservation of power, and the simple opera-tion of switches puts the machinery into full operation The centrifugal pump has been found most ad vantageous, particularly with electric motors.

A high pressure system protocts a given district where the mains and hydrants have been installed and in the case of New York this territory extends from Chambers to Twenty-third streets, and lies be from Chambers to Twenty-third streets, and lies been the Hudson River and the Bowery and Third Arenue. The pumping stations are located outside of districts littley to be affected by any possible configuration, and free from danger from neighboring buildings. They are situated at South and Oliver streets and at Gamewoort and West streets. The hydracts in this system are of the type shows in the illustration, and are spaced along the mains at an average interval of 270 feet, and to reach a building on fire in no case would there be required a length of hose greater than 450 feet, an important depsideration, as the pressure in a line of hose diminisher rapidly

Let us assume that a fire-breaks out in this protected (erritory, and the slarm is transmitted in the usual way, territory, and the alarm is fribinthized in the usual way, rither from a street box of an aptomatic free-larm telegraph to fire beafquaght. These 21 is sent out one the fire-larm circuit, gift be, various free bouses in the city including the two high-pressure stations in the city including the two high-pressure stations at these stations might and day there is always an operator on duty who sits at a takephone switchboard by which the station can be pull in communication not only with the scene of fire but with headquarters and with the other station. Special Listenbown: In with with the other station Special telephones in meta-boxes are distributed in close preximity to the hydrants through the high-pressure district, and con nect direct to the station, a special service being main tained by the telephone company. In front of the operator is a large board containing the numbers and operator is a large board containing the numbers and locations of the various sizem bosos throughout the district, those to which his own station responds in-medizably being destinated in red. The sizem conses in over the regular circuit the gong sounds the appro-priate number, which is also registered by perform-sion on a tape, on which also is printed the time by a clock. If the sizem is one for the sestion the conston on a saye, or when also printed the time by a clock. If the slarm is one for the station, the opera-tor immediately grasps the lever of the marine tele-graph, and the signals to start are sounded and shown on the large indicator on the wall. The over spring immediately to their pinces, the which continues at the

d and the oliers and mach appointed stations. From the switchboard everything can be controlled and regulated. The current is can be controlled and regulated The current is switched to the motors, and the ponderous pumps are soon revolving, another switch opens electrically-controlled valves regulating the water supply, while recording and pine, never an analyzing the water analyzing and pine, never an an indicators are before the cyst of the dibet engineer. Not every fire requires the food, of water that can be set in motion from the station, and the standing order is to start one pump, regulating the pressure at the outlet at 155 pounds. The nact order must come from the chief of the fire? department at the fire, and may be a call over the telephone to increase both water supply and pressure or an order to shut down the pumps. As shown in the picture, the chief at the fire is even in closer the picture, the chief at the fire is even in closes touch with the pumping station than he could be with a sumber of separate engines located at the access of activity. The scene vitable the station when some content of the country of the countr and molectors, the entire structure is at his command Outside with the firemen there is naturally more activity, and high pressure working has occasioned certain changes in equipment and methods from the beginning the high pressure required the best and strongest hose procurable, and this in sufficient quan

strongest hose procurshie, and this in sufficient quan-tity is carried in large wagons. These hose carts are moved from the rear of the fire houses, from which they followed the engines, to the front and are given right of way over other apparatus in the streats. When the summary of the summary of the summary of the label, for must alarms the engines were not sent out, but held in respre in the fire houses. In two houses to have compared to the summary of the summary of tion hose companies maintained. As the hose is heavy, the work of carrying and hauling it is par-ticularly archous, so that, in this respect, the labor of the firems at the fire has not been lightened by mechanical progress. The automobile hose wagon used by the New York Fire Department, however, has used by the New York Fire Department, however, has demonstrated its complete user/inuses for transporting the beavy loads-of 3 inch hose much more rapidly than the tendered areas by horses. Immediately on reach-ing the fire, the hose is unloaded, a learn connected with the byfarns tutlet, of which is reached, as a successive length are hid to the seems of action. The former engineer of the fire sugarias with his lever key takes his position at the hydrant and watching the takes his position at the hydrant and watching the pressure gaps at the outlet, open or shuts the valves as ordered. The line is stretched where the exigan-ices of the "a visuo demand, perhape to the standpips connection," which must be placed at the sidewalk toes to the building walls, and which connects with the standpips itself within the building with its out-tless and hose resis on each flow. It is this that, af-tores the first predection to a superspace, in addition to the standpips that the standpip is the standpip of the term of the standpip is the standpip of the standpip of the term of the standpip is the standpip of the standpip of the term of the standpip of the by the firemen for the higher stories, or it may be used to deliver a stream to a fire in an adjoining building The connection may be made to the sprinkler sys tem of the building through a similar outlet or cellar pipe to flood the basement, or, as shown in the illustration, two lines may be siamesed into the water tower The permanent nextle holders of the hose ns may be used, while for a single stream th wagons may be used, while for a single stream tripod nosise holders are employed, as the powerful presentes render holding ble hose and directing its preactically impossible seven for two or three firmes. The hose may even have to be holsted up onto a fire escape, and there fastened or clamped with one of the devices which have been developed for this purthe cerview which have oven developed for this pur-pose. Now a single line from one of the four out-lets is practically as powerful as that derived from a fire engine, so that the concentration of pumping power on any single block can be appreciated "Pur-ther, when it is realized that these streams can be delivered with a force sufficient to tear off cornices and make their way into the very seat of the fire. their power may be appreciated

and make their way into the very seat or the, wertheir power may be appreciated
their power may be appreciated
their power may be appreciated
to the highpressure system has been most successful, and giving
on a par with the secolient engineering inswhell
it is design and construction A sufficient quisitity of
unter is brought to here at the earliest possible on
ment, and the usually quenches any ordinary firs
it is straight way drowned to be received to the
it in straight way drowned as more the high-pressure
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for the distribution mains will be half display in adoloing streets, peesing out from the pumpling setution has
two systems of mains, architectity consisted his myton and by defining characteristic properties. Whys, els
seme point of intermediates. While the Tappendarks Sym-

tom, which incidentally uses gas motors and direct acting pumps, in use for a number of years, said which has recently been extended, and with a willwhich has recently been averaged, and with a will-planned project under way in San Francisco, it would seem that the day of the fire angine had passed and that the contral fire protection method would gook take its place in many other large cities.

fore & 1916

A High-Promure Pire Reduction Valve. Son after the successful inauguration of the high-pressure fire service in New York city, the Sciamuran Amenican\* called attention to the need of a suitable regulating valve to be used at the hydrant, in or to render possible the control of the pressure on single line of hose and its adaptation to the work hand. The need of such a valve has become increase.

ingly apparent For some p or a water-lower or a water-lower or a street of a skyreraper, the highest preserve sign be decauseded, while specific highest preserve sign be decauseded, while specific highest preserve and a street of the same or a ridgolinity former and the same on a ridgolinity building. What was needed, as was pointed out in the Schwartzro Aussian decircle light and portable, that could be applied readily with the hose at the byfrant outside and enable any preserver from zero to the maximum hose in witness of water from friedom and otherwise and water from friedom and otherwise water from friedom and otherwise.

Musiller valve, which recently For some purposes, as for a water-tower or stand-pipe of a skyscraper, the highest pressures a be demanded, while for other lines at the same

This seems to have been secured in the Kiely and Mueller valve, which recently has undergone some thorough tests by the New York Fire Department, and has been adopted for high-pre

boats

The valve is small and compact designed to be
transported on the hose tender with the smaller tools.

There are two pressure gages, one on the inlet side
showing the pressure at the bydrant furnished by the
pumps, the other the reduced pressure as the water passes out of the valve into the line. After the hose has been stretched, the engineer opens the central valve of the hydrant with his key wrench, and then valve of the hydrant with his key wrench, and than the gate valve to the outlet from which the line is taken. The handle of the regulating valve is screwed down, allowing no water to pass. A half turn of the handle in the direction of an indicating arrow allows water at a pressure approximately of 15 pounds to pass, a full turn 30 pounds, and so on up to the full or hydrant pressure. In short, the pressure on any ie from such a valve is entirely under con the from nucl a valve is entirely under court, and the engineer merely has to watch his gage and turn his handle until the desired point is reached when the pressure is maintained automatically In a recent test before the engineers of the New York Department of Water Supply, Gas, and Electric-

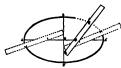
ity witnessed by the author as the representative of the Scientific American at the St Edwards High Pressure Station in Brooklyn, it met every condition Pressure Batton in Brooklyn, it met every conditions imposed Different pressures from 76 to 100 point and were put on the mains by the pumps in the adjacent station, and the pressure on the line was reduced as ordered by simply turning the handle of the valir Thus when over 240 pounds was recorded at the hydraul, 40 pounds was delivered at the nozate The Adjactance it and mainfeasance of any desired pressure were far more easily and satisfactority controlled than would be possible with a steam fire eagins Variations

adjustment and maintenance of any desired pressure were his more assisty and satisfactority controlled than were the more assisty and satisfactority controlled than in the pressures on the mains did not affect sensibly the operation of the valve while when the line was shut down at the needs no effect was manifest. The valve constaints security of a valve body, containing a seat, main disk, piston, auxiliary valve; a clashram, a compression by lings, as adjusting serve, and the portion of the metal sensetting the disk and piston are ginteructed of one pisce, and the portion of the metal sensetting the disk and piston has in it a small piget through which help for some passes up over the select, which, being of greater dismeter than the sist, drives the latter down to its seat, thus shutting of the pressure. The nota part of the operation is bredget by a combined of greater diameter than the sist, drives the latter down to the seat, thus shutting of the pressure. The nota part of the operation is bredget by a combined of greater diameter than the joyst through which the high pressure is convayed to the top of the piston, quickly causes a reduction of the state of the pressure is conveyed to the top of the piston, quickly causes a reduction of the state of the pressure is conveyed to the top of the piston, quickly causes a reduction of the state of the pressure is conveyed to the top of the piston, quickly causes and the state of the pressure is repeated, as before the reduced pressure has been alwayed to the sand transfer the sand transfer when the sand transfer of the pressure above the piston, which, order to fig piston area, causes the main valve to dose. This pressure is repeated, as either a which the light pressure, represent the sand interval when deplaced, as a big and the desired of the pressure of the pressure of the piston, as the pressure of the piston of the pis

### Correspondence.

## A SIMPLE METHOD OF COMPTROCTING AN BILLIPER.

b the Editor of the SCHENTIFIC AMERICAN: In your immes of July 14th and August 25th for the year 1906, two methods are suggested for drawing an ellipse with the aid of a compass. But the g an ellipse with the aid of a compass. But the mpass has pever produced a true ellipse, and these milti are merely close approximations. Also, in the benamed issue, there is a method for constructing ellipse by means of a network of tangents. This an ellipse by means of a network of tangents. This method also was proved inaccurate by Mr Warwick Worthington in the number for July Bist, 1908, and he in turn offers a solution by a network of tangents which I believe gives a perfect ellipse, although the without in the perfect of the perfect of the perfect of the perfect is, however, a simple way of constructing an edlipse of larg desired dimensions solely with the aid edlipse of larg desired dimensions solely with the aid



A SIMPLE METROD OF CONSTRUCTING AN ELLIPSE

of straight-edge and pencil. No originality belongs to my method, but it is readily proved to accord with

correct mathematical principles
On a straight-edge or ruler mark off a distance QP equal to half the desired major axis, also, from point equal to hair the desired major axis, said, from point P. a distance PM, equal to hair the desired minor axis Referring now to the drawing, we construct per pendiculars AA' and BB', and lay the ruler down so that the points Q and M fall exactly upon these per pendiculars. The point P will then fall somewhere on the curve of the proposed sillipse By shifting the er about, in such a way that Q and M always fall reler about, in such a way that Q and m savery and me lines AA and BB; respectively, the mark on the ruler at P will give the position of any number of points, which afterward may readily be joined by a continuous line

EDWARD M WEYER.

Washington and Jefferson College, Washington, Pa.

## Astronomical Photography.

The plan of photographing the entire heavens origi-nated with Monches in 1887 The death of this emi nent man of science was one of the adverse factors which have completed to delay the work, which now, however, promises to draw to a trigmphant conclu-

The importance of the universal photographic star chart to the astronomer of the future cannot be over estimated It is now generally acknowledged that the stars are in motion with respect to one another, and stars are in motion with respect to one another, and our entire soles system is in motion through space, so that one day the constallations will be seen from a sensibly different point of view Changes will come to pass in the apparent arrangement of the star groups, and in the curres of prear they will develop, so that something may ultimately be discovered of the real structure and laws of the distant bodies of the universe It may be that the chart how being prepared will enable the astronomer of some centuries are as the series of the contract of the tem revolving within it.

hy has b years to be the only method of revealing the struc-ture of those fascinating formations, the nebules, at all adequately, the star chart on a large scale, though it be more prosaic to lay observation, possesses an in-calculable value of itself. The wonderfully accurate calculable value of itself. The wonderfully accurate phetegraphic chart may lead, with the aid of a corre-spendingly accurate system of tieseurement, to the discovery of entirely new laws of the unifying which directly affect our own planet. Seth Chandler discovnameworky at enturely new laws of the unityfest blight directly and/or our own plane. Self Chandler Glaconsed the law and evaluated the magnitude of an oscillation of the control of the control of the control of the control of the vicinity of the control of measures and for driver sight and nestero of the control of measures and for driver sight and the segmination of measures and for driver sight as a measure observation should be the fast control of the control of measures and the control of th

## Scientific American

chart over the elder method of observation is quite ty explained. The image of a star in the tele scope is very rarely absolutely steady, for the light prior to its reaching the instrument, has to pass prior to its reaching the instrument, has to peas through the vertiable sea of our own atmosphere, con-stantly disturbed, in practically all portions, by cold and hotaft currents. Rids shots are familiar with the sort of effect which is thus produced. On a blas-ing hot day, when currents of air are rising from the beated ground, the target seems to dance before the beated ground, the target seems to dance before the year, growing talker and shorter and breaking in pieces, with the bulls' we now in one corrar and now aftequether vanished Something of the same thing happens the state manage when the except is set cally when it is in a country much broken up by when it is in a country much brok cially when it is in a country much broken up by mountain chains or arms of the sea On all but two or three nights in the year the star image will be seen dancing and quivering in the telescope, more or less as the sir is much disturbed or uniform And when the observer tries to set the spider line of his measuring apparatus upon the image, he has to make some sort of estimate of its mean position and set upon that. It is really surprising how accurately this upon tax. It is really surprising now accurately this can be done after long experience, but the unstead ness of the object is bound to set a limit to the accuracy which even the most practised observer can obtain Now it might be thought that this constant vibration of the object would be more fatal to the plo bration of the object would be more fatal to the pho-tograph than to visual observation, but this is not the case. For the motion is very rapid, several times a second does the atar make a small jump from its mean position and return to it, and, on an average, if jumps every way with equal frequency. The consequence is that the photographic plate, which keeps a record of every jump, produces in the end an image which is certainly larger than it ought to be, but which is, as a rule, enlarged equally in every direction, so that its center remains still where the center of the image belongs And when the plate is put of the image belongs And when the plate is put under the microscope of the measuring machine—a device capable of accurately determining a fifty thousandth of an inch-and the threads which are moved by the measuring screw set upon the photographed image, the enlargement of the latter is more than com pensated for by any advantage which accrues from steady (mage

Bu the superiority of the astron over visual observation is not confined to the art Numerous articles in popular periodicals have quainted the general reader with the wonders of the nebulm as revealed by the photographic plate cumulative effect of light upon the latter rend constille to obtain acquisite delineations of faintly uninous objects by means of a sufficiently long expo-ure. Vast new regions of space are thus being ex-lored, and affil waster regions await of per explora-tion Prof E Ray Lankester, in an address before tion the British Association, stated that "the invention of the dry plate, which has made it possible to apply the dry paste, which has made it possible to apply photography to astronomical work is the chief cause of the great expansion of astronomy since 1881: To quote Prof. Lankester further "It was the dry plate which made long exposure possible, and thus enabled astronomers to obtain regular records of faintly lumi us objects, such as nebulæ and star spectra. Roughly nous objects, such as neuties and star spectra Rougnly speaking, those visible to the first maked eye may be stated as 8,000, this is raised by the use of the best telescopes to 100,000,000. But the number which can be photographed is indefinite, and deposits on length of exposure, 1000,000,000 000 can certainly be so reopried By the photographic method hundreds of new variable stars and other interesting objects have been covered. New planets have been detected by the dred Up to 1881, 220 were known During 188 only one was found, namely, Stenhania, being No 220. discovered on May 19th Now a score, at

discovered every year".

The appearance of Halley's comet this year suggestions. the fact that some of the most extraordinary revelstions of photography in astronomy have been in the case of these strange members of the solar system The yest size and tenuity of comets render them liable to disturbances from other celestial hodies photographic Blate has shown that the comets utterly transform themselves in a few hours' time. These transformations are sonsellmes evidently due to gravitation from some selfathors, and sangle, apparently, from actual collision with plaintily bodies or matter, which not only distorts have amortizen breaks the which not only distorts have amortizen breaks the Whater photographa on soncessive nights above that the shape though the sonce of the content of 1883, where photographa on stoncessive nights above that the state of the shape of the shape of the shape to the shape the shape to the shape the shape to the shape to the shape the shape the shape to the shape transformations are sometimes evidently due to gravi-

interpy, it is now possible, with the aid of improved in had methanics, to construct a photographic re-

ting telescope with as much precision as ment as have been expended upon the greet refracting talescopes. Prof. Ritchey has obtained aplended re-sults from his two-foot photographic reflector, and his photographs thus obtained of the nebula have a wider appeal than to the scientific mind alone. To many a person untrained in astronomical lore, indeed, the pho-tograph of the great spiral nebula in the constellation tograph of the great spiral nectual in the constraintion of Andromeda, obtained with the Yerkes two-foot reflector, would probably appeal at once as that of a most marvelous spectacle—a vast planearry system in the making About the same proportion of the sun to the planets in our own system is to be observed in the great central spherical condensation of the whirling mass and the smaller condensations in the latter Some of these smaller condensations, at varying dis-tances from the central semi-formed orb, have assumed an almost perfectly spherical shape, others, again, are formless, though vastly denser than the nebulous mat ter extending, in a circular or elliptical form, through out the entire spiral system It may be observed that the spiral character of this nebula was never even suspected until it was photographed in 1888 by Roberts with a reflecting telescope. Yet the result then obtained was crude indeed when compared with what was obtained by the instrument at the Verkes Observa tory Seen by the naked eye, this great nebula ap-pears only as an indistinct hazy spot among the stars. The greatest visual telescope in existence fails utterly to reveal the amazing spiral structure so brilliantly shown in the photograph

Judging from the results obtained with the two foot instrument Prof Ritchey estimates that an eight reflector, if used in a climate where there are ble atmospheric conditions, would photograph suitable atmosph stars which are fifty times fainter than the faintest stars which can be seen with the largest modern re-fractors "This means,' says Prof Ritchey "that uch a reflector would enable us to penetrate seve times farther into space than can now be done with the greatest visual telescopes, and therefore that such an instrument would reveal to us a universe seven times seven times seven-more than three hundredtimes greater than the universe which is revealed by the most powerful modern refractors I know of no opportunity which has ever been presented in the entire history of astronomy greater than that which now awaits us in the construction of a large modern reflector and its use in astronomical photog-

It is estimated that the cost of such an instrument as Prof Ritchey advocates—that is, one of eight-foot aperture, and embodying the latest developments in optics and mechanics—would be about one-thirtieth that of building a battleship of the 'Dreadnought'

### The Current Supplement.

One of the most important articles in the current SUPPLEMENT, No. 1796, is that by George Neumann, in which the compulsory working of German patents is discussed, a matter of great importance to American manufacturers. The adhesion of locomotives is a most important factor in designing engines, and must be considered at every step in the preparation of a gen-eral design. An article on this subject appears in the current Supplement Roze's excellent description of a profile puppet show, and how it can be made and used is continued. When shipbuilders commenced turning out iron and steel vessels, navigators found themselves confronted with the problem of overcoming the magnetic forces of their ships and making their compass needles point toward the magnetic orth How the problem is solved is told by William C Ward in a paper entitled "Compass Deviations" Frank C Perkins writes on Canadian pulp making in the Algoma district, Ontario Irish linens and some features of their production are discussed by Sir William Crawford

Three kinds of bonch marks were used by the United States Geological Survey in the spirit leveling in Ohio from 1898 to 1908, inclusive, according to a bulletin by Messrs 2. S Gannett and D H Baldwin The first form was generally used in the vertical walls of public buildings, bridge abutments or other subor public outletings, pringe automatical or of successful and a statistic meaning structures, being a circular broase or aluminium tablet, 1½ inches in diameter and ½ inch thick, appropriately lettered, and having a 3 inch stem comented into a drilled hole. The second form was employed where masonry or rock forma form was employed where masonry or rock forms tion was not accessible, and consisted of a hollow wrought iron post, 4 feet long and 3½ inches in out-diameter, split at the bottom and expanded to 10 inches so as to resist pulling from the ground These posts were such as feet in the ground—after having bean coated with asphalt—and a bronze tablet similar to the one aireafy described was then riveted to the top. The third form was little used and is now alto-gather discontinued, being the ordinary split belt of copper, I both in diameter and 4 inches long

## HOW TO ESCAPE FROM A SUNKEN SUBMARINE

## METHODS APPROVED AND DISAPPROVED

In a diving manual recently published by Slebe, Gorman & Company, Limited, submarine engineers of London, we find some excellent suggestions on the subject of saving the crews of submarine boats.

The problem of saving the lives of a crew of a sub-marine vessel is by no means easy of solution The requipment and apparatus which is invaluable on shore it quite useless under water It would be quite only to construct a submarine boat, the crew of which ould be safe under practically every conceivable set would be sare under practically every conceivable set of circumstances, but such a vessel would be so ham pered by her safety devices as to have little or no military efficiency. In the option of Messrs Biche & Gorman it is essential that the salvage of the vessel and of the crew must be looked upon as entirely Inevitable delays in the arrival of the salvage arate Inevitable delays in the arrival or to marrage vessel and in getting purchase on, conditions of tide, weather, atc. render it almost certain that a submarine cannot be raised in time to save life it is taken for granted that an accident which will

endanger the lives of the crew will result in the in rush of water in large quantities A minor accident to the machinery would result only in an involuntary

to the machinery would result only in an involuntary rash to the surface, owing to the reserve buoyancy of the boat, and any ordinary small leakage can be readily dealt with by the machinery at command.

When, however, there is a collision, or when, by some other mischance, a hole is made in the hull, the water enters freely, and the effect will be the descent of the vessel to the bottom This may not be very fast, but, assuming that the water is contents more rapidly than it can be explicit the vessel will not doubtly with the same of the vessel will not doubtly with the same than the properties of the vessel will not compressed to a pressure equal to that of the water at the depth in which she has foundered. As soon as the sail water comes into contact with the battery or at the depth in which and has followed.

It water comes into contact with the battery or with the terminals of the dynamo. If this be still

working, chlorine is evolved, and the air re-maining inside is vitiated

maining inside is vitlated
if anything is done, it
must be done quickly Accordingly, the following
steps must be taken

(a) To render the crew ndent of pois

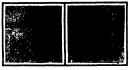
(b) To preserve the drowning in

the boat, and of escape from the boat, and ascent to the surface The devices to bring these about at present

known are (1) Air locks for es-

(9) Detuchable cham bers or life boats. (3) Belf-contained dress

Air locks slone are of Air locks alone are of little use except in shal low water, but combined with (2) or (3) are es-septial in all methods of escape The air lock may be a portion of the boat provided for the special purpose, or the general cavity of the boat may be used in which case the pressure inside the vessel as be made equal to that of the water outside by simply allowing the water to enter for it is mani festly impossible to open an aperture until the pressures at both sides of it are equal The great objection to all forms of detachable chambers or life boats is their size weight, and resistance, if made large enough to contain all the crew of a modern all the crew of a modern submarine, and as such a chamber would have to be carried as a superstruc-ture, it would be in the Hke-liest position to be injured in case of collision Moreover, what is further against sny device of this kind is that the crew are expected in a moment of considerable excitement to undertake an entirely nevel operation which there is no means



on the left shows a longitudinal sex, showing an air trap in use, three p in safety helmots, and one emering-tower that on the right a trans a submarine, showing air-traps in the air traps, wearing shorty-helmorphy from the consing-tower

of trying previously Experience has shown that even plain drop safety weights fall at the critical moment. A life-saving device to be efficient must be able to fulfill promptly the three conditions, a, b, and c, previ

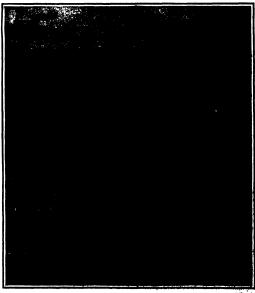
ously referred to, and in order to meet them a special form of diving heimet has been designed by Messra. Slobe & Gorman which is quite self-contained and not dependent on any feature which is liable to get out of order. The helmet, which is large enough to allow or order The neimet, waten is large enough to allow the head free movement, is sloped away to fit the shoulders, and is connected to a short jacket of strong waterproof material in front of the jacket, inside, is a pocket containing a combined air purifier and onygen generator, consisting of two small chambers formed in one once, "Hisse shambers are charged with a naturated substance which, when its conjust with the water varyor of the heath, give not gone engages pas and forms a spantle affaid. The situal is to text and the state of the state o inches by 16 inches. The dress can be put on without assistance in 30 seconds. When on it prevents a mab from drowning, and in proof of this it may be sidd that it is now it overprise under water with perfect the control of the con removal of the weights.

r.moval or the weignts.

At Portunouth the British Admiralty have in use a huge water tank, at the bottom of which is exceted a skeleton submarine boat, serving the purpose of permitting the men to exercise in the helmet described The men having first been trained to put on the dres

quickly are set to practice getting into and out of the air look. They are after ward lowered in the air lock to the bottom of the tank, where they enter the submarine, and find their way to a ladder leading to the coming tower, the They then either Sont to the surface or return to the starting point, the op-erations being repeated until the officer in charge considers the men proficonsidered the hirst pro-cient. These arrangements have been designed to rep-resent as nearly as possi-ble the same conditions as would obtain in a submar-ine boat that had been

If the hole in the sub-marine be at the top, the water will gradually dis-place the whole of the air If, however, the hole is be If, however, the hole is be-low the top, then the wa-ter will only enter until the air, which cannot ca-que, has been compressed until its pressure is equal to that of the water out-side. In the latter case there is no difficulty in moving at and putting on the helmet dress, pince there is air inside the ball. In the former case. hewever, unless some up-cial provision were made, this would not be so and



best having similar to be bettern, all will be compressed either make the desiration from the having pit on their question for some compressed att. mill it is their targe to escape of other terrors, because the partial compressed att. mill it is their targe to escape of other terrors, the partial compressed att. The compressed attention of the compressed attention as all those through the compressed attention as all the compressed attentions and compressed attention as a compressed attention of the compressed attention and compressed attention and compressed attention ROA HER INCYSE LISTS T, SAMENA MARATERIA



## ARTIFICIAL RADIUM BATHS AND DRINKING WATER

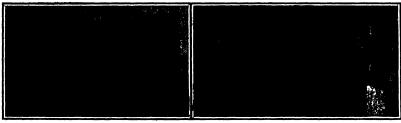
BY DR. ALFRED GRADENWITZ



Until quite recently the curative effects of mineral vetters were serviced to the obsentical substances held in solution. The lank of mineral solventin in some vetters of remarkable therapeartic values could not be explained on this principle. Moreover for some un appointable reason it was observed that most waters place their beauting properties when taken at come below the could be propertied with taken at come below of the could be contradictory phenomena can now be

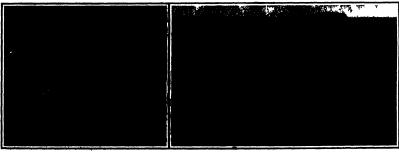
plausibly explained by ascribing part if not all of the cursitve powe to radioactive a be ane s In fat carry all minenti-waters have been found to con tain radioactive constantion. This emanation being an attenued by unable body most waters lose their activity in a few days so that the cursive ag it cause consert its action unless the water lose daministered as soon as possible after lessing from the ground Only at the water, containing and concilies substances caps a tew waters containing and contribute substances caps

ble of giving off a constant supply of enans i u lav been found to keep at least part of th ir a liviy for a y length of time. This trailing of all a y o rad on i y a ray suggested the artificial control of rad a iv y so as to impart curstive effects to ins. wa o o consecute the efficiency of patterns longs. The is of adding variable assumed of munacilous base been car continued on pupy [40])



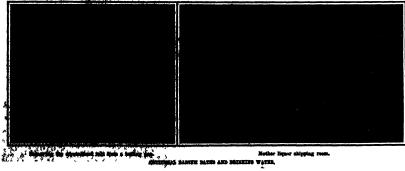
Laboratory for obtaining highly concentrated radioactive substances.

Laboratory for course chemical process



Washing plant for radioactive subplaness treated by chemical processes.

tioneral view of the famous Kreumach vall y



## ALEXANDER GRAHAM BELL AND THE TELEPHONE

THE STORY OF A GREAT INVENTION

The telephone was first introduced to the public in 1876, and put to the first practical or commercial use in 1877 During that year was organized the first as-sociation or company to hold the pations. The first companies which systematically exploited the business companies which systematically exploited the business write formed in 137%, one for New Regiand and one for the rest of the United States and Canada. These two companies succeeded to all the rights and property of the original association. The explait represented \$170.00 the value of the patents, and \$100,000 in cash. Early in 1379 these two companies were consolidated into one company called The National Bell Telephone into one company called The National Bell Telephone Company, the first company to attain any prominence The capital of this company was \$850 000, deposited among \$500 shares of \$100 par value each The sum of \$850,000 in shares was given, share for share, for the stock of the two old companies, and \$200 000 in the stock of the two old companes, and space out in shartes was left in the treasury This treasury stock was sold for the best price obtainable, as the money was required and yielded eventually \$430,000 in cash The last 500 shares of this treasury stock sold for

The last 500 shares of this treasury stock show each in the fail of 1879 a settlement was effected with the Western Linkon Telegraph Company, whereby the most formidable and powerful competitor was removed growth of the 1810 shares, of which there were company, and though that you will be shown to the stock of the 1810 shares, of which there were company, and though that price was probably never action that the stock of the company would also the stock of the company would have been \$8.500, which were the company would have been \$8.500, of the original investors have been credited with realizing if not more, at least as much as the, yet no dividends least as much as this, yet no dividends

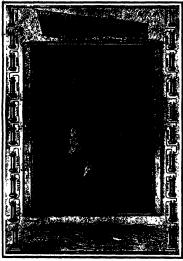
teast as much as this, yet no dividends were paid by this company
Because of the rapid increase in business, more capital was required, hence in 1850 the American Boil Tolephone Company as organised and the business of the National Boil Tolephone Company, transferred to it The shareholders of the National Bell Telephone Company were given for each share of their stock rate given for each share of their stock six shares of the next shares of the next stock. At the same time, \$600 shares of the treasury stock were sold at par in 1881 the first deglend was paid.

The American Hell Telenbare.

The American Bell Telephone Company continued in business until 1899 during which time the capital stock had nd from \$5 950,000 to \$25,886,300 increased from \$3.950,000 to \$25,885,000 When the American Bell Telephone Com pany transferred its business to the American Telephone and Telegraph Company, there had been over \$38,000 of actual cash paid into the treasury of the company by the shareholders as against \$35,885,000 expiral outgasding During the time no stock dividend or surplus in each to be for stock leaved was paid. The mended to be for stock leaved was paid.

of the American Bell Telephone Com-pany's share during the year ranged shore \$100 a share, and the company was paying 15 per rout dividends yearly! The demands of the business required much larger capital than could be provided under the corporate powers of the American Bell Telephone can pany Henry, the American Telephone and Telegraph pany Henre, the American Telephone and Telegraph Company was organized to perpeta the long-distance traffic, and to it the business was transferred in 1897 The dividends were put on a 7% per cent hast, and were increased in 1906 to 8 per cent, at which right they still continue. Since 1906 the stack of the Ameri-can Telephone and Telegraph Company has been in-creased from time to time as the business called for money At the close of 1908 there were in the hands of the properties of the telephone to the period of the telephone and telephone to the telephone to the telephone of the properties of the telephone to the telephone telephone to the telephone to the telephone teleph

This tremendone industry is the fruit of Mr. Alex ander Graham Bell's indomitable and persevering work as a young man His story of the invention of the telephone is a story of patient endeavor and experi-ment, continued for very in the tase of many diffi-culties. He approached the subject more or less as a continued of the continued of the continued of the had been issuebers of articulation and the laws of speech, and he had himself bone educated to follow in their footsteps. In bowlood he constructed a tall-ing machine At the age of eighteen he made dis-coveries which he thought original concessing the part played in the production of verse bounds by the reaso-lesses. e of the cavities of the mouth. It was not long be(ore he learned that Helmholts had not only made the same discoveries, but had produced the sounds of the vowels by combinations of tuning forts, operated by electromagnets. In order to repeat Helmholt's ex-periments, Sell began to study electricity. In 1873 he constructed an experimental apparatus in which each the sell of the between the pone of an electro-magnet. Current was applied intermittently by means of a wire which was attached to one prong of the fork and alternately and and broke the contact with a cup of mercury at the fork whrated. As the prongs of the fork were attracted by the magnet each time the current was ap-plied, the fork was kept continuously vibrating and sounding 87 pressing a telegraph key, the intermit-tent current was sent through the line wire to the s-civing instrument, which consisted of another electro-civing in the constant of the constant of the con-sistence of the constant of the constant of the con-stant of the constant of the constant of the con-tact of the conbetween the poles of an electro-magnet. Current was



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ALEXANDER GRAHAM RELL

nist reach it with the proper frequency to cause it to vibrate. It was Bell's idea to use several transmitting forks of different pitches, and as many receiving forks of the same pitches. As each transmitter would affect only the particular receiver that was in union with it, a number of tolegraphic messages could thus be set simultaneously orac a single wire. Attaveard dest simultaneously orac a single wire. Attaveard sets simultaneously over a single wire. Atterward Bell ausstituted for the tuning fork a steel plate or reed, with one end clumped and the free end very near the poles of the electro-magnet. The transmitting reed, lits the tuning fork which it superseded, definitely made and robus consists, and thus made the curvent intermittent, and the receiving reed vibrated are registerally only when it was in union with the transmitting reed. Bittl later Bell conceived the idea of mitting reed Still inter Reil conceived the idea of polarizing or magnetizing such reed by clamping it to a pole of a permanent magnet, allowing its free end to project, as before, over the poles of the electromagnet. He knew that the vibration of the manustized reed would induce currents in the colle of the transmitting slactromagnet and that these currents, resching the receiving electromagnet through the line wire, would at the reed of the readver late vibration if the two reeds were tunded to smade submitted by the policy of the collection of the collection of the collection of the circumbrendate. The directly was apove broken and fight current, instead of being intermittent, was undulatory, varying in intensity and direction in exact accord-ance with the motion of the transmitting reed. The two instruments ways exactly althe, and other could be used as the transmitter. Several such pairs of Distruments, of different pitches, could be employed, with a line wire connecting the two stations, and the plack-ing of any reed, at either station, would theoretically ing or any reed, at etther station, would theoretical cause the reed of the same pitch, and that reed on to "speak" at the other station, so that a number meassages could be transmitted simultaneously in ea direction Bell, however, thought that the current thus generated by the vibration of the r ble for practical use in multiple telegraphy as he therefore turned his attention to a system which included a battery and a mechanical circuit breaker Meanwhile, in connection with his professional

Meanwhile, in connection with his professional work, the instruction of dest unites and their teachers, Siell had been experimenting with the phonuntegraph, an instrument devised by Lone flower the making wish instrument of a light woods never was attached to a membrane structured over the small end of a femural, and the long arm terminated in a bristle which touched a sheet of gas, covered with hampblack, which

was drawn along at a uniform speed. When a sound was uttered into the fun-When a sound was uttered fatto the fun-nel the sound waves caused the mem-brane to vibrate and the bright to trace on the modes disas a sinous curve, on the modes disas a sinous curve, actly that not only every pitch but every quality of voles, and each of the vowel sounds, produced its characteristic tra-ing. The principles of the phonustermsh is almost identical with that of the phonograph Ball discovered defects in the instrument, and as he ishored to re-move than, it cocurred to him that the best form of phonasticpreph would be an sound waves are likewise received by a membrane, the ear drum, and the vibra-tions are transmitted to the inner ear by a series of home lovers. Dr Blake, as auriest to whom Bell applied for precise nel the sound waves caused the mem aurist to whom Bell applied for pr information concerning the structure of information concerning the structure of the ear, suggested the employment of a real human ear instead of an imitation An anatomical specimen was prepared, with a fine straw attached to one of the bone levers to serve as a writing point, and Bell experimented with it in 1874, while he was attill working with his reeds and electro-magnets

Another possibility had occurr Another possibility and occurred to him. He knew that when a vowel sound is sung into an open plane all the strings that correspond to the overtones, who give the sound its vowel quality, as well as the string corresponding to the funda-mental tone, are set into vibration, so

mental tone, are set into vibration, as mental tone, are set into vibration, as that the pian repeat the particular vowal uttered. In lite manner, the transmitting reeds, it undientify numerical manner in the component single vibrations of a rewel particular to the receiving reeds, which would reproduce the wired nould at the distant station. Bell also considered the possibility of employing, at each station, one 'large electro-magnet instead of a many small socie, in common the second state of the second state of the second control of the section of the serial sound waves, in the cold to the electro-magnet, instead of in the line virs, "In the cold to the electro-magnet, instead of in the line virs, "in mentary electrical vibrations, corresponding to the components of the sectial count waves, in the could of the electromagnet, instand of in the line whys. "It is considered to the component of the country of the coun

## MOTION APPARATUS FOR AMATEURS

### AN INGENIOUS FRENCH INVENTION

The production of photographs of moving objects has hitherto been denied to amateurs, for various res-sons. It requires complicated and costly apparatus out special appliances.

rithout special appliances. A simple apparatus, called the Clnephote, has been brised to obviate these difficulties and to put motion decography within the power of every anateur phographer, at least to the actent of producing animated fireties of his Friends and his children, for the Clnephote does not pretend to vie with the subsortie apparatus by which thousands of instantaneous photopales of a long and complex some are impressed on materials of feet of Sim.

small perforations, causes the disk to rotate intermit-tently, pausing after each advance long enough for a single exposure. At the same time the shutter is alagie exposure. At the same time the shutter is automatically caused to open when the disk stops and to close when it resumes its rotary movement. For the disk containing 24 pictures arranged in a circle, the bearing is fixed at the center of the plateholder, but for the disk with 15 spirally arranged pictures, the bearing is free to move in a vertical side and, as the owing is free to move in a vertical since and, as the reciprocating pin engages successively with the spi rally arranged perforations, the disk is displaced in such a manner that each picture is made in its proper place in the spiral curve in either case the move-ment of the mechanism is automatically arrested when work and essentially similar to the mechanism em-ployed in making the negatives But, as only a very feeting illusion is thus produced by the disks which contain 24 pictures, there is provided, for these disks alone, another apparatus which can be turned by hand, sione, mouner apparatus which can be turbed by hadd, slowly and for an indefinite time, showing the pictures repeatedly in their proper order A third form of apparatus is furnished for the purpose of projecting the pictures on a screen with a lantern

A writer in a contemporary refers to numerous fail-ures of east iron fittings which were, however of the usual run of commercial extra heavy fittings of which neither the metal nor the thickness were sufficiently

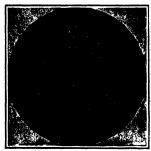


Fig. 1.--Disk with 24 plotures.



Fig. 2.-Watching the metica pictures.

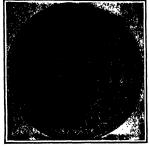


Fig. 5.-Disk with 75 pictures.



Fig. 4.—Apparatus for projecting the motion pictures.

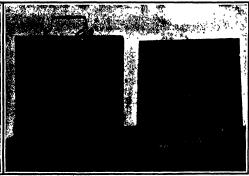


Fig. 8,-Cinephote camera and platcholder,

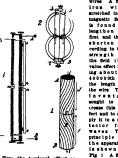
### A MOTION APPARATOR FOR AMATEURS.

The Clinephote comprises two distinct pieces of apparatus one for making the pictures, the other for each hibiting them in such a manner as to give the illusion with the contine area of 
good The growth of cast iron under repeated heat-ing is discussed and reference is made to Outer-bridge's work. Steel Sittings have also failed, within the suthor's experience only four out of twenty five steel gate valves, 6 inches, 8 inches, and 10 inches in sicel gate valves, 8 inches, 8 inches, and 10 inches in diameter, were fairly tight after one, year's zer for A thoroughly sound steel custing can withstand highly approached steem, which does not initiate defects but rapidly develops them. Gun iron is high grad-ter or more, and is adapted for 180 pounds of steam with \$30 deg 7 superbest. Analysis of various speciment of Iron which failed under 250 deg, superbest are given, but the following surveasfully withsteed 300, as, superbest for four years. \$81(mo., 172 per cost, ziūjbun, 0885 per cent, phosphorus 085 per cent, managanese, 081 juod action, p. 100.

## AN INGENIOUS TORSIONAL WAVE DETECTOR

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

Prof A G Rossi of the Royal Polytechnic Institu of iurin has devised a new form of detector for use it wireless telegraphy with his of special interest because f the novel prin iple it employs. He uses found in the property known as



How the torsional produced

wires A fine iron wire stretched in a magnetic field is found to lengthen at first and then shorten ac cording to the strength of the field the value effect be ing about 1 400000th of the length of the wire The sought to in crease this ef fect and to apply it to a de tector for waves The principle of the apparatus Fig 1 A fine iron wire is stretched in a

iron or nickel

stretched in a variety pair of the stretched in a variety pair of the stretched pair of the opposite sense with the intensity J J and longitudinally as above by the arrows At the same time a cur ut is sent through the wire from to to and this given a circuit magnetization to the vire with an int naity libe result of the constitution of the stretched pair in the stretched pair of the stretched pair in the stretched pair of the stretched pair in the stretched pair of the stretched

wire will have a torsion represented at  $\mathcal O$  in the direction of the arrow, this being what is known as the Wiedemann torsion effect. Leaving the longitudinal-field as it is if we reverse the current in the wire the and as it is two reverse to course it in the wires the correct and a size of the correct and t diameter leaving a gap at the center for the mirror as A spiral of insulated copper wire is wrapped about the glass tubes with the two halves colled inversely and the current consect from a and b. bits the wire. The copper spiral is designed to receive the waves from the antenna and it acts to modify the effect which we have seen above to be given by the combination of the alternating current and the bar magness in the the alternating current and the bar magnets in the wive Ween to ware as are necessively we have a constant torsion effect in the wive, that is a constant rate of vibration. When on the construct rise war affect occurs in the copper spiral the rate of the vibration is modified and the line of light on the screen is changed. The terminals a b are connected to a pair of vertical antenna wives which are insulated from ground. All the rest of the appearance is held insulated from ground. All the rest of the appearance is held insulated from ground. All the rest of the appearance is held insulated from the foor. Light for the beam is given by a Norratz lamp and the same attenuating correct circuit is used for exciting the attenuating correct through the wire. The copper spiral is formed at the top to the antenna and at the bottom to ground With such an arrangement the instrument shows the effect of waves received from a distant station and effect of waves received from a distant station and

we notice varietiens in the beam of light due to this cause. It is designed especially to be used for receiving signals formed by a necession of waves, such waves to follow each other in series so as to form periods of low frequency. The frequency is first adpersons of low frequency The frequency is links as to be the same as that of the vibratis wire Besides the tuning of the high frequency wave this allows us to use a second or local tun-

ing of the low period
waves It should be
remarked that Prof.
Rossis is strument
transforms directly as
electric vibration of low frequency into a mechanical vibra-tion and contrary to other detectors, there is no transformation of energy between the effect of the name and the registered optical indication. It is thus extremely sensitive record of the signals, the author proposes the use of a photo-



graphic band descend-ing in front of the beam and as the variations of the lat strong enough light is reflected by the mirror on the cell Owing to the sensitiveness of the instrument there is no doubt that it can be used with much bee expenditure of power at the sending station. On the other hand it simplifies the apparatus which is needed at the receiving station. An alternating current gas erator is not required in this case, but a simple vibra-tor will give the needed impulses for exciting the

## THE HEIGHT OF THE ANTARCTIC CONTINENT

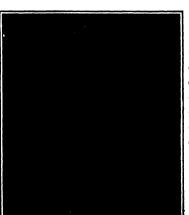
BY WALTER LANGFORD

Our knowledge of the Antarctic continent is daily be oming more precise. Soon after Shackleton's memeral le dash toward the South Pole had furnished very

imp stant data in regard to the interior I the continent Charcots voyage sup-jii d valuabl additions to out knowl dge of the boundaries of this vast terri The French expedition succeeded in surveying a urately a great many miles of coast line that had previously beet entirely unknown or only conjectur

the results of these expeditions prove it at the mass of land accumulated about the bouth Pole is even greater in com-parison with the other continents than had previously been supposed. The ele 11 its involved in this comparison in ind an estimat of area and a deter name a Both of these elements require xact and emprehensive surveys The at an joch when our knowledge of the loids estimates of the mean elevations of the known continents above the see but are far too low. This mean cleva-tion is the height of a fictitious plateau obtained by distributing the mass of the outlient uniformly over its aurface; i.e. it is the quotient obtained by dividing the volume by the area. Humboldts esti-mates of the mean elevations of conti-nents are Furope 6.7 feet. North America. 748 feet. South America. 1151 feet. Amia 1161 feet. entire known land surface of the globe 1904 feet Ex-cept in the case of Europe these values differ enormously from the more recent estimates given below. This discordance estimates given below. This discords shows the necessity of thorough expl

tion and accurate surveys although a general estimate can be obtained from elements of a totally different character as we shall see in connection with the



KIAN KERSEN OF THE OCCUPANCE.

Antarctic continent Kruemmel who was the next after Humboldt to attact the problem estimated the most solvential of the suter's known know arrives of the state o

Anthretic explorations have entirely changed the face of the problem; and here raised the Antarctig omitions to the first place which was figured; considered by Asia. The exact use of tractive knowledge which we proposes in regard to the other continuous knowledge which have proposed in the continuous testiff inching in the case of the Antarctis, of which we know only the fore points total having high crimined as fore points that have bent raiseded as

for points that have both resolute its the expeditions and environment to determine the same and the distribution of expendently good notes the distribution of expendently good notes pile the same and the same pile the same and the horizontal same and the horizontal same and the horizontal same and the 
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### CURIOSITIES OF SCIENCE AND INVENTION

Revise A Town IT Rall, Pictaged Barwith is a trainlead of house on the Pictaged Barwith is a trainlead of house on the internal value of the Northwestern Rallway i Yana. There are five flat care loaded with miner' oftense at two rooms seed, each room being 13 by 14 y 5 feet. Extreme height above the car is 18 feet 4 Wentherford, Mineral Wells & North-In addition there are two cars containing

A TRAINLOAD OF MINERS COTTAGES.

ms, and two cars that carry other wreckage of the coal-mining town of Rock Creek, Texas whose mines were abandoned The train was moved

successfully at the rate of 15 miles per hour, and around a number of six-degree curves having the outer rail elevated four inches.

WORSE FARES FOR ARREUR.
When the Zepatin balloon was dostroyed in a thunder storm two years ago it was asserted that a static discharge of electricity from the metallic frame of the balloon had fainted the gas "To obvites such an accident in the future, a German inventor has devised a balloon haring a wooden frame, which ho claims is balloon haring a wooden frame, which ho claims is

A BALLOOM FRANK FORMED OF WOODER STRIPS.

to the inversor are much smaller than in the Eappelin type of balloon, using aluminium framework. Accord-ingly, the wooden frame makes a more efficient support for the envelope of the balloon when the gas is ex-sanded by the heat of the sun Another advantage of the wooden frame is the fact that it can be repaired

A frame thus constructed was exhibited at the well. A frame thus constructed was exhibited at the Frankfort Expedition last summer, and proved quite an attraction. The accompanying photographs show how the frame is made up in a network of wooden strips which is very strong and yet possesses a con-siderable degree of destbility. The model illustrated is 65 feet long and 5 feet in diameter. The meshes of the network are much smaller than in the Expedin of the network are much smaller than in the Expedin

not only lighter than aluminium, but is st

1.

ENGINE WITH MEADLESS CYLINDERS In order to produce a completely-balanced engine, a inventor has recently adopted the unique plan of an inventor has recently adopted the unique plant or providing the engine cylinders with two pistons each The steam enters between the two pistons, separating them. This renders the cylinder heads useless, for st them. One of the pists

A 15 7 164

right angles to each other which are respectively connect ed to the two piston rods. Thus a forward and backward impulse is given simultaneously by the steam entering one cylind

cylinder of the same type, which repeats the operation while the first cylinder exhaust There are no joint, strains or withintens as the fore. There are no joint, strains or withintens as the fore. There are no referrably closed by suitable doors, to prevent dust or other extraneous matter from entering and closing or clogging the working parts. These doors are shown open in the accompanying photograph. The model illustrated has

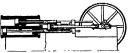
is provided with a hollow pist rod to receive the rod of the other piston. The engine shaft is provided with two cranks at there is an equal distribution of the load When the pistons reach the end of their stroke, steam is admitted to a second cylinder of the same type, which

own remarkably high efficiency, and is so perfectly

nium hemisphere and the tire, owing to the clasticity of the air cushion, and as they are constantly in col-tact there is no wear. This ingenious little machin will blow a 16-stop or larger organ silently and with very high efficiency It requires no attention, and current sufficient to run the motor is obtained by concurrent summent to run the motor is obtained by con-mection with an electric lamp socket. As it is practi-cally silent and occupies a surface of only 45 by 16 inches and is 23 inches in height, it can be placed on the floor beside the instrument. The speed of the motor is constant, but automatic control of the pump ing is provided by a chain connection between awinging bracket and organ reservoir or believe By means of this chain the motor and hemisphere may be drawn through an arc of 90 degrees into the exattion orawn unrough an arr of we degrees into the position of full organ, while a spiral spring riturns them to the neutral position, as shown in the illustration. The rising and failing of the reservoir thus cause the speed of the believs handle to vary from zero to maximum, and keep the bellows full automatically



The peculiar fiying machine illustrated herewith was one of the novelties at the Olympia Aero Show held recently in London It is the invention of Messrs. d Ottino, and consists of a large number of small planes arranged in an endless band and driver somewhat after the manner of a tread mill, the idea being that as these planes move along from one end of the machine to the other at a rapid rate they produ



SECTIONAL VIEW SECURING CROSS CONNECTED PURTONS.



A HUADINGSVILLEDER BALANCED PROTUS

balanced that it will run smoothly on the filmsiest of SUPPORTS.

A HOVEL AUTOMATICALLY ADJUSTABLE ORGAN BLOWER.

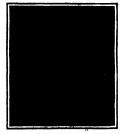
A novel method of adapting electric motive power to organ blowing is shown in the accompanying engraving The mechanism comprises an accurately turned hemisphere of aluminium driven by a small electric motor fixed to a bracket swinging horizon



a lifting effect owing to the slight angle to the hori sontal at which they are set. As they move around at one end in passing from the bottom to the top they one end in passing from the bottom to the tup they are at an angie to the horizontal and all produce a lift, while as they descend at the other rad the is downward movement produces a lifting effect. The machine was exhibited without a motor but this fact did not defract from its novely. The tids of the mov-ing planes is that the lying machine will lift listed diverly in the dar and that no forward motion over the ground will be required

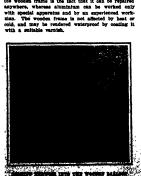
A SERPESTINE WHARP

One of the longest where it world, almost a mile in length, or to be exact, 4 700 feet is at Port Los Angeles, Cal It extends into the Pacific in a long serpentine curve. The reason for this construction is that it offers better resistance to the strong currents and the buffetings of the waves than if were perfectly straight. Until the nearby harbor of San 1 edro was developed by the Federal government, the big wharf at Port Los Angeles was a very busy place, but of late it is comparatively seldom us cept by the Japanese fishermen, who have for colony along the adjacent beach n, who have formed a



WOVEL PLROTERS ORGAN BLOWNS of by a swinging b

jally on a vertical spindle. The hemisphere drives by driving an ordinary hispale wheel fitted with a possible that a shown in the limitarision. There are the least cycle chain and aproched gear, for still the description of the state of the large state weeken had been still description of the state chain when the state ch



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A PREPERTUR WHART WEARLY A MILE IN LEBOTH.

### RECENTLY PATRICTED INVESTIGATE.

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any position will be firmly secured together

### Electrical Bevices.

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trap that is very effective and kills the mal without injuring its pelt.

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Full hints to correspondents were printed at the head of this column in the issue of March 18th, 1989, or will be sent by mail on request.

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changing, though merely gravitation at close mags. Now let us consider the Nigelia via the cases. I have been a consider the Nigelia via the cases I and 2 would return to the liquid distance of the Nigelia via the cases will be the cases, while makes the cases will be the cases will be compared to the cases of it were at A or A, and moderals A however would neturn to the liquid if the autience were at C, and moderals or cases of it were at A or A, and moderals or cases of the cases of the liquid if the surface were flat or concave. Therefore we find at liberty moderal would return to the liquid if the surface were flat or concave. Therefore we found from a convex surface than from a flat one, and (1) more molecules can escape per second from a convex surface than from a fact one, and (1) in concave. Hince the wayee presents at a given insuperture for a given liquid depends on the number of molecules (that one short surface) is the concave. Hince the waper pressure at a given insuper of the concave with the case of the concave will contain the case of the concave will contain the case of the concave will contain the concave will contain the concave will be a concave with the concave will be compared and the value concave will be compared to the concave will be concave will be concave to the concave w

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He assumes the case of a tleship, with \$6,000 hor on three screws, the outer scraws by turbines of 15,000 horse-powe 140 pounds initial pressure, the series being driven by a Herrick relative engine of 380 pounds absolute presents and a superheat of from 100 to 300 de-grees. Assuming a water rate of 38 pounds for the turbines, Mr. Lovekia. rives at his ultimate water rate of pounds for the combination as fo The revolutions of the tr

275 per minute.

The revolutions of the rotary engineers The revolutions of the rotary engine will be 180 per minute

The effective stroke of the rotary on gine will be 17 feet.

The clearance will be 12 per cent.

The stroke, plus the clearance, will be

to 19 rose.
The distance swept by the piston per hour, allowing for clearance 19 × 160 × 60 == 183,400 feet.

The total cubic feet of steam to be  $390,000 \times 3.3 \times 1,248,000$ The area of the piston will be 1,248,000

- == 6 25 souare feet.

182,400 Assume pistons 16 inches high,  $6.85 \times 144$ 

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width of each piston. (3 in all.) The horse-power developed by the ro tary engine is as follows 2 expansions == 0 8465

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sure 97 pounds,

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—— mean to theoret77 80 ical pressure.
(Approximate.)

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for rotary engine.
Assuming 8,000 B. H. P., with a propeller efficiency of 60 per cent.
The turbines will give out 30,000 B. H. P.

at 50 per cent The rotary will give out 8,000 B. H P at 60 per cent.

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-= 10.5 pounds of water per B. H P.

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(Continued from page 168 the mother liquor this pr complicated and expensive

The brine is vaporised in graduating works, the output of which depends on season, the direction and intensity winds, as well as on the temperature and moisture of the air Each of these graduating works (the total length each is approximately 25 kilometers) is divided into seven compartments of de-creasing lengths traversed consecutively by the brine, and the sait content in-creasing as each compariment is trav-After leaving the last compart neut the weak solution is from sight to twelve times more concentrated. The bramble walls of the compartments are exposed to the wind. Hence operation of the plant is difficult in variable winds On the other hand, the surrounding all which is strongly ozonized and charged with atomized brine, not only makes the graduating works a very cool and pleasant place to stay in on hot days, but af fords a welcome opportunity for utiliz-ing the curative effects of the refreshing

and the curative elected of the salt air.

The pumps of the graduating works are operated by a number of water wheels. are operated by a number of water whe is fed from the river baise through a sys-tem of canals. From the graduating works the brine is pumped through con-dults to the reservoirs of the evaporating

house, in order there to be boiled Both the evaporating house and gradu ating works date from the middle of the eighteenth century when the Salines were erected the ancestors of most of the workmen employed therein having

The primitive boiling process carried The primitive boiling process carried out in open sait pains has recently given way to a modern multiple vaporizer with improved devices for recovering the mother liquor and the suit. It consists of a steam boiler and a number of vapor

izers an air pump etc

As the holling of the brine and mother liquor is carried out in vacuo at low tem perature the decomposition of valuable chemical compounds is entirely prevent ed, thus increasing the curative effects of the products

When the brine has been holled down to such concentration as to contain in a hundred kilogrammes (wenty two kilo hundred kilogrammes (wenty two kilo grammes of common sait a supersatu rated solution is obtained from which the sait crystallizes. As the concentration of the brine increases then increasing amounts of saits are separated which in part to the saits an acid taste. These saits are used for various therapeutle purposes while the brine left after the separation wante the brino left after the separation of the common sail forms the mother liquor used for other therapartic purposes and of which about 50 000 liters are produced per annum. For shipping great distances, the mother liquor is further concentrated until it crystallizes in

shown that the Kreuznach water con tains not only plentiful amounts of gas your radioactive emanation but carries along from the interior of the earth ra dioactive substances Part of these sub-stances as the water during the gradu air will separate along with iron oxide calcium and barium carbonate while an other part remaining in solution forms in the brine a permanent source of emana Geltel, as well as by Dr K Aschoff, have shown that the residues contain not only considerable traces of radium, but radio thorium and actinium as well The mother liquor derived from the Kreur nach brine as well as from the bathing salt was likewise found to be strongly radioactive. Further experiments demon strated the possibility of isolating traces of radium from the residues of c trating the radium salts. As the springs of Kreusnach yield every year radioactive residues by the hundredweight it was deemed advisable to attempt the produc tion of radium saits on a large scale. Mr (Concluded on page \$70)

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Neumann, Director of to an method worked out by Dr Aschoff One f the wings of the boiling house onverted into a radium factory which converted into a radium reactory want a has been operated for over a year. The entire annual production of active resid uses is now worked into radium saits an end which has made possible an exten sive therapeutical use of radium com-pounds, both as a white insoluble powder of high radioactivity for compress a ointments, etc or directly in a dried con dition, and—on a far larger scale—in the shape of gaseous att ted to water

an apparatus perfected by Mr. Neu-mann renders it possible to determine the amount of emanation imparted to a n quantity of water

Mr Neumann has recently worked out an improved charging method which is especially suited for imparting to any liquids a very intense activity (2000 to 50000 Mache units) However no de-tails as to this method have as yet been ade known

Satisfactory results have been obtained by treating, by means of charged drink ing or bathing water chronic rheums-

malady, and in some cases in some trou ble in the general condition (incomnia, loss of appetite, etc.) In some cases this reaction manifests itself as a slight feel-ing of interioriton during the bath and

some minutes afterward, while other pe-tients feel especially refreshed and invig-orated. This reaction, which strikingly mbles the reaction produced by many natural bathing and drinking waters, is

of too recent date to allow definite con-clusions to be drawn, it doubtless con-stitutes a valuable addition to the present methods of modern medicine

### ALEXAUDER GRAWAW BELL. (Continued from page 162)

the free end of one of his steel reeds to the center of a membrane capareeds to the center of a membrane capa-ble, like the send drum of taking up any kind of vibration. The fixed end of the reed was not to be clamped but was to be hinged loosely to the phairsing mag-net, so that it would no longer have any definite rate of vibration but would follow all the vibrations of the membrane A similar instrument was to be used as a receiver But the apparatus was not constructed at that time because Bell doubted whether the currents generally the action of the voke alone we suffice for practical telephony Further more, he was induced by his associate to devote his attention to multiple teles raphy

One day in tuning and testin One day in tuning and testing the clamped reeds of his transmitters and re-ceivers he found that the receiving reed vibrated and sounded when the trans mitting reed of the same pitch was plucked although the battery was not in This discovery convinced him circuit This discovery convinced hin that the membrane speaking telephone dovised a year earlier could be made to

The long and patient researches tha followed cannot be here detailed Mem branes with attached patches of iron and steel of various dimensions were tried and the apparatus was varied in man; other ways. Then it was discovered tha a thin sheet of iron could be used as the membrane. Thus were developed, success sively, the apparatus patented in 1876 the telephones that created so profound a sensation at the Centennial Exhibition in the same year the instruments pat ented in 1877 and the familiar hand tele phone which with some modifications is still universally employed as a teleph receiver

From the beginning Bell had at at the production of an undulatory cur rent capable of representing all the ponent harmonic vibrations of vocal sounds This fact sharply distinguished his invention from the old Reis telephone which, employing an intermitten current produced by alternately making current produced by siteriately, maning and breaking the circuit, reproduced only the pitch of a sound, but not its quality or timble and was consequently unable to transmit vocal sounds and articulate

aperch

It is safe to say that no patents for
any invention have been subjected to
such long and bitter litigation as the
Bell telephone patents During one of
the many suits which involved the validity of the patent Mr Bell was on the stand for fifty two days during which time he recited the history of his inventhat still characterise both his welting and his speeches. As we see it to-day the telephone is practically the same in principle and construction as when it principle and construction as when as left its inventor's hands, so far as the receiver is concerned. Few inventions have changed so little. To be sure, the ing or bathing water chronic rhemma- left its inventor's hands, so far as its months of colors, and gout, while a receiver is concerned "Pew Inventor number of other complaints are favor above changed so little. To be serve the complaints of the contract of the superstate has a proposition of the complaints of a designating of a designation of the complaints of the comp appearance of the apparatus has been greatly modified. The multiple switch have been introduced, and the very dis-cult art of telephone engineering has been

m ability. He even states that had it t been for his father-in-law, Mr. Hub (Concluded on page \$75.)





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where the property of the only art with which Professor Bull's name is linked by wireless signaling, too, he made some significant of the work of the property 
the experiments were conducted
Aerial locomotion is another art with
which Professor Bell has become identi His interest in the subject was ed when, in 1880, he began to make kite-fiving experiments, largely for the sake of his health He started with a Hargrave box kite and eventually devel oped the tetrahedral principle, which is now well known among aeronauts. Dur-ing the course of his experiments he found that he needed the services of civil and mechanical engineers. Accordingly, a little association was started under the name "Aeria! Experiment Association." which included among its members the late Lieut, Selfridge, Glenn Curtim, Baldwin, and McCurdy, all of them now well known. Baldwin and McCurdy acted as engineers, Curtiss was the motor author ity. The association was Mrs Bell's idea, and was founded to carry on Mr Bell's own work. She sold the only piec of property which was here in her own right, and which had not been given to her by Mr Bell, in order to finance the Although these engineers were all originally engaged to help Mr Bell in his tetrahedral experiments, the sent in an terrandral experiments, the numbers of the association ended by help-ing one another Selfridge was the first man who profited by the association's ansistance. Believing that it was best to follow in the footsteps of others, and then to improve on their work, he start-ed with gilders, and finally built the "Red Wing," which flew successfully Next came Baldwin's chance He embod-ied his ideas in the "White Wing," in ted his Ideas in the "White Wing," in which wing tips were introduced, con-troiling devices which are now the sub-ject of so much controvery. Then came Curtiest" "June Bug," which won the Scientific American Trophy McCurdy fol-lewed with the "fility Dart." Baldwin and Ball worked at the tetrahedras prin-ciple. In More Societ, surrelineates which and Ball worked at the intrahedral periodic in Nova Scotia, experiments which are not yet concluded. Curties remained it Rammondeyrt. New York, and finit yellow year received that it was security and acceptance of the conclusion was seen acceptance of consumptingations. See the conclusion of the contract could be consumed to the conclusion of the contract of the c



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MUNN & COMPANY, Inc., Publishers 381 Breadway, New York, N. Y. served the purpose of keeping the members in touch with one another

HEIGHT OF THE ARTARCTIC CONTINUES.
(Concluded from page 464)
concludes that, if the continent covers an

CONCINGENT FORM page 484) concludes that, if the continent covers an area of 5,200,000 aguare miles as Bruce and Kreummel assume, its mean elevation above sea level is about 6600 feet with a probable error of 1 680 feet. If this estimate is approximately con-

rect, as the results of the recent explora-tions appear to indicate, the Antarctic continent is by far the highest mass of much on the globe. By the addition of this huge polar cap the mean clustering of the entire land surface of the is increased from 2.312 feet to 2.706 feet. The process by which Meinardus reached these conclusions may be sketched as follows it was already known that the mean height of the b ometer over the northern hemisphere is 08 millimeter higher in January than in July, but that the corresponding barometric height for the zone extendin equator to 50 degrees south latitu is 21 millimeters lower in January than in July Hence, as the entire mass of the atmosphere and consequently the ole surface of the globe remains co stant, the mean barometric height for the zone south of 50 degrees south latitude, which is equal in area to about one-fourth southern hemisphere, must be bout 36 millimeters greater in January than in July

observations made by recent explorers, however, led Meinardus to the conclusion that the mean atmospheric pressure over the zone lying between 50 degrees south istitude and the Antarctic circle is not greater, but is 0.73 milli-meter less in January than in July This result increases the January deficit of pressure and restricts the area in which it can be made up to the Antarctic zone, in which, consequently the mean atmospheric pressure must be 11 millimeters higher in January than in July Within the Antautic (inch the only observations available for this discussion are those of the ships Discovery Helgica and Southern (ross,' which together com prime the records of four entire year In three of these years the atmospheric pressure was lower in January than in Thus the area in which compensa July tion for the deficit can be sought is still further restricted, apparently to the A

arctic continent Meinardus finds the explanation of this puzzling state of affairs in the great height of the Autarotic continent. The atmospheric pressure diminishes as the elevation of the point of observation in creases, and the difference is greater at low than at high temperatures. Hence, in a region where the atmospheric prisure is constant throughout the year the sea level, it is appreciably higher in summer than in winter at an elevation of several thousand feet. For a given ele vation this difference increases with the difference between the summer and the Hann have computed that the me mounteric temperature of the Antarctic ontinent is +266 deg F in January (Antarctic midsummer) and -148 deg F in July (Antarctic midwiner) In these conditions it can be calculated that the mean excess of lanuary over July pressure (!! millimeters) required for the entire Antarctic zone would be fur nished by a mean elevation of that zone of about 4 400 feet on the assumption of a constant atmospheric pressure at the sea level But the coasts of the Antarctic continent have been explored aufficiently to make it reasonably certain that that continent occupies very approxi-mately, two-thirds of the entire area of matchy, two-thirms or the entire area or the Antarctic zone. Hence, on the as sumption of a constant atmospheric pres-sure over the remaining third which is covered by water, Weinardus arrives at the conclusion that the average height of the Antarctic continent is about 6,600



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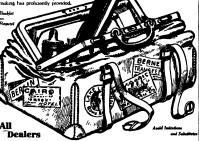
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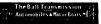






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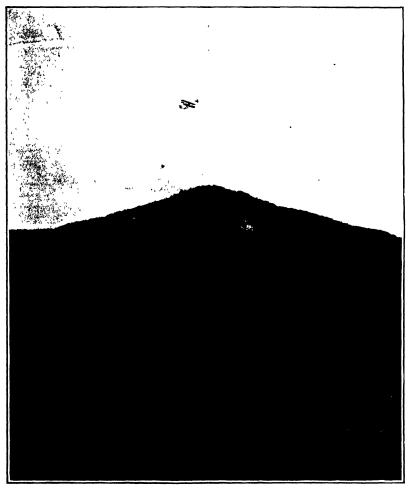
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Vol. (11. No. 24. NEW YORK, JUNE 11 1910 [10 (LYTY 4 COP) # 25 00 A YEAR



### SCIENTIFIC AMERICAN ESTABLISHED 1845

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NEW YORK, SATURDAY, JUNE 11th, 1910

The Editor is always that to receive for examination illustrated articles on sublects of timely interest. If the photographs are sharp, the articles short, and the force instantie the contributions will receive special attention. Accupied articles will be paid for at regular space rates. THE REW ERA OF ARROWAUTICS IN AMPRICA

T is a curious anomaly that, although America the birthplace of the practical flying machine a distinction which is universally admitted and stands in little danger of future disputation the further development of the art of flying, as first demonstrated by the Wright brothers, has hitherto demonstrated by the Wright brothers, has hitherio been confined mainly to Furopean countries To us, it has always seemed probable that our apathy was more apparent than real and that when sufficient stimulus was offered, the art of aviation was

sure to come into its own, and its development be cuted with a zeal that was worthy of the energy and liberality of the country in which the first prac thal flying machine had its birth.

Evidently the needed spur has been afforded by the henomenal achievement of Gienn H Curtiss in mak parameters as neverment or Grenn H. Curriss in making his recent flight from Absany to New York at the unprecedented apend of over fifty miles an hour—a feat which vindicated both the far-sightedness and the liberality of the New York World in offering a

prize of \$10,000 for such a flight in connection with the recent Hudson Fulton festival

Apart from the fact that so great a distance was covered at so high a speed there are other considerations which largely account for the powerful hold which this flight has taken upon the public imagins tion, such for instance, as the altogether untried na rure of the course the almost complete absence of suitable landing places, and the absolute composure with which, when an emergency landing had to be made, the aviator circled in his path, swooped down, hird like, upon a small open clearing above the rocky and bill-covered cliffs landed, started again on final leg of his course above the crowded shipping of the North River, and finally came to rest on Gover of the North River, and finally came to rest on Gover nors Island at the very doors of the house which was built for him during the Hudson Fulton seronautical contests. Here was a man who at the very first trial and over a course which because of the encompassing mountains and ravines and the resulting air currents was believed to be exceptionally difficult accomplished with evident composure and at times with a suggestion of complete sang froid a feat of flying which only six months before, was regarded as a dream of the enthusiant

When the news of his accomplishment was finshed When the news of the accomplishment was many throughout the country its effect was instantaneous and positively electric. The last doubt as to the prac-ticability of long-distance cross-country dying van labed and the evidence of the awak cling was shown in the almost immediate offer of over \$100.000 in privas for flights of a similar character, to be held during the present season in various parts of the United States First came the simultaneous and mu-nificent offers of \$25,000 by the New York Times and the Chicago Evening Post for a Chicago-New York flight of about 860 miles and of the Vew York World and the 81 Louis Post Dispatch of \$70,000 for a 8t Louis-New York race over a 1000-mile course Then the Washington D C Chamber of Commerce and the Aere Club of Washington offered \$20,000 for a 225-mile race from Washington to New York and as we go to press a \$10,000 prize is being promoted in St Louis for a flight from that city, over a distance St Louis for a flight from that city, over a distance of about 250 miles to Kansas City and \$5,000 is offered for a flight over a 250-mile course from Indianapolis to Chicago

are the attractive prises that have been made available, within a week of Curtiss's flight, to pr long-distance feats of the same character. At the same time, through the liberality of Mr Edwin Gould, as noted elsewhere in this journal, attention is being directed to the mechanical improvement of the aeroplane itself, with a view to enlarging the ability to remain continuously in the air and extend the dura-tion of its single flights. The offer of the large sum of \$15,000 for the best successful aeroplane provided with two motors, one to be held in reserve for em

gency, is certain to prove a great atmolus to inventors and constructors, and should result in the production of some very interesting combinations of motive power. The above résumé of the happenings of the past week surely justifies the statement that, when the history of the art of flying in America comes to be written, this period will stand out as second only in importance to those ever-memorable days, when the Wright brothers were making their flights above the sand hills of North Carolina in the first practical mancarrying and controllable aeroplane propelled by its

### THE PERIL OF THE SUBMARINE.

UDGED by the number of tragic disaste has overtaken the submarine during the past few years, this greatly dreaded instrument of war might seem to be as great a menace to friend as to fee in the absence of accurate information as to how many lives were accounted for by the submarine during the Russo-Japanese war, it is a question whether in the last ten years the submarine has not caused the death of a greater number of its own crews than it has of the enemy, and we hazard the statement that considerably over half a hundred lives have been sacrificed during the past hundred lives have been sacrificed during the past ton years in the ordinary peace maneuvers of sub-marine vessels. The long roll of disaster is headed, in point of loss of life by the sinking of the French vessel "Pluviose" on May 26th last, off Calais, when 28 officers and mes lost their lives. The most fatal, as it is the most frequent, cause of serident is collsion We all remember the running down of a British submarine off Spithead by an outward bound Ori ent liner which came up from behind unnoticed, and apparently passed entirely over the submarine Within the year a similar accident happened at the en trance to the English Channel, when a large ship ran through a fleet of submarines at night time sinking one of the boats. To the same cause was due this recent French disaster, the 'Pluviose' being struck by the paddle-wheel of a Calais Dover passenger steamer

as the latter was leaving Caisis harbor
At the same time, although we deplore the terrible loss of life which has occurred, we must not permit these disasters to shake our faith in the utility of the submarine for the accidents have been chargeable to nefficient handling, or shall we say to lack of sufficlenity we experience, rather than to any inherent mechanical defects in the design or construction of those due to collision the losses have been chargeable, not to theoretical or mechanical defects in the ance, not to theoretical or mechanical excess in time boats themselves, but to carelessness or inexperience in their manipulation. Testimony to this affect was afforded by the diary (an amazing document) which the commander of the Japaness submarine, that was rently sunk continued to write up to the very hour of his death, in which with characteristic Japanes nobility he took the blame for the loss of the vessel directly upon hims if Mechanically speaking, the directly upon himself highly-developed submarines of to-day as exemplified in the latest types built for our own navy, are thor-oughly reliable. The writer speaks from experience having spent some four hours and traveled some of Cape Cod, in the recently completed "Stingray" The vessel descended, ran on an even keel, rose to the surface and was steered, with absolute precible air within the submarine was perfectly whole and free from odor and the composure of the officers and crew betokened a perfect confidence in the stability of the vessel

The disaster to the "Pluviose" procisims the The disaster to the "Futurions" proclaims the necessity for that eternal vigilance which is the piedge of safety in travel not merely beneath the see but in the air and on the dry land. The charge can be no longer made against the submarine that it is "blind" In the perfected periscope, the vessel is provided with an eye whose vision is as clear as that of the binoru lars of a commanding officer on the bridge of a war ship Furthermore there has been produced and is now obtainable a periscope which commands a view now obtainable a periscope when commands a view of the complete horison during such time as the sub-marine is within, say, ten or fifteen feet of the sur-face, and with such an instrument, given clear weather and a careful lookout, the danger of being run over by a ship coming up from behind should be completely eliminated. The accident to the "Pluviseems, however, to have been due to the sub marine rining to the surface just ahead of, and in the path of, the Calais steamer. Here is a very real and not easily prevented danger. Although the com-manding officer may take a careful survey of adja-cent waters and note the position of other craft beforce he diven, week is the speed of modern remaind that a city may usuity have peaced held foce projects ity by the them with submarine rises signi to the city face, even though the period of submarries he lim-ited. Collision on right; to the surface is a form of accident which for the present, at least, must be recarded as not entirize presentable. regarded as not entirely preventable.

Jeneie ex, 1000

### "MEGHANIPULATR."

If the proper role for language to play in the round of our delly life is that not of massive, but of servant of our secsessities, we should survival to the secsessities, we should survival to the secset of the survival to recognized necessity.

recognised necessity.

It is agreeably to this spirit that we indorse use of the word "mechanipulate" to designate the handling of a piece of work by a machine At the present time, all the many elaborate and ingenious operations which are performed by mechanical h and fingers frequently with a close approximation to the delicacy and dexterity of the movhuman hand, have to be designated by the word "ma-A W Wood, and as far as we know, its first use to be found in his article on "Modern Stereotypy," 12 the issue of the SCIPATIFIC AMPRICAN SUPPLEMENT of May 14th, in which, speaking of a plate that has been cast he says "It is left face up in position to be most easily mechanipulated, the position to be most easily mechanipulated, mechanism used for the purpose acting with a gen ite, uniform motion to position the matrix with accuracy," etc. Then, in a foot note the writer says. "In my experience, I have frequently felt the need of a word which should express the 'handling' of its work by a machine, as the word 'manipulate' expresses the by a machine, as the word 'manipulate' expresses to handling of the work of a man by his hands. To fill the gap I have made hold to coin and use the word mechanipulate,' which is here employed.' In bring-ing the suggested word to the attention of the public, we invite a discussion of its merits in the co

### THE COLDEST REGION OF THE ATMOSPEERS

HE decrease in the temperature of the air with increasing altitude—exemplified in the fact that the top of a mountain is colder than its base—is a matter of common knowledge. It is a fact that occasional inversions of this distribution of temperature may occur—as when fruit trees in a valley bottom are nipped by a frost that does not touch the hilitops but it remains true in general, that the temperature of the air decreases upward and that the air at great altitudes is extremely cold as compared with that at the surface of the earth

Until Telescrenc de Bort announced his discovery of the isothermal layer, eight years ago it was not sus pected that this decrease of temperature did not ex-tend upward to the limits of the atmosphere. Now, r, we know that at a certain altitude, averes middle latitudes, about 11,000 meters ( miles), the fall in temperature with increasing alti-tude ceases rather abruptly, usually giving place to a rise of temperature for a certain distance upward,

rise of temperature for a certain distance upward, above which the temperature romains approximately constant as far as the highest ascent and particularly constant as far as the highest ascent apparatus Hunce, above any given pool on the earth's surface that air is collect Just below the region of the upper the control of the provided of the provi coverer, the strain (ospherr),

The altitude of the isothermal layer varies with the basedmetric pressure at the earth's surface with the season, and especially with the latitude. It is some-what less over the poles than over middle latitudes and very much greater over equatorial regions than anywhere also in the world. In other words, the decrease of temperature with altitude continues to a crease of temperature with attitude continues to a much preast religit within the tright than cleawhere, and this explains the fast that the lowest temperature ever registered in the atmosphere was met with almost exactly over the equator, viz. —4.3 deg C (—115, deg F), at an altitude of 19.50 meters (about 19 miles), at Shiratt, on Victoria Nyana, Angust 20th, miles), at Shiratt, on Victoria Nyana, Angust 20th,

This was one of many interesting results of the remarkable series of sounding-ballon ascensions about the remarkable series of sounding-ballon ascensions about the cutoff in equatorial Africa by the expedition under Beson and Illian, sent out by the Royal Observatory. Other testing the complete report of which has just been published by the observatory.



### Scientific American

John II, Igro.

EMOINERING.

Generally is proceeding so satisfactorily at the
Satum locks that in the upper or lake-level tier, which
formed the shiper of reconst illustrations in our columan, about one-half of the work is completed. The grand total of excevation done on the canal during April was 2,632,468 cubic yards.

In a recent paper, Rear-Admiral Bacon of the Brit-isk navy, discussing the probable battleship of the tag navy, discussing the products activished to the future, arrives at the conclusion that the race between gun and armor, which has been going on for over half a century, has been decided, for the moment, over nam a century, name own section, for the moment, in favor of the gun, nor is there any indication of there being a chance of improving the armor and strengthening general construction, so as to render ships reasonably immune from armor-piercing projecting projecting the strength of the strength o

The fact that the excavation of the Panama Canal through the Culebra range of hills has set in motion a mass of 2,000,000 cubic yards of material, which is mass of 3,000,000 cente yards of material, when is sliding into the excavation apparently on an inclined anhatratum of clay, serves to illustrate one of the many advantages of the present high level canal over one at sea level The sea-level cut would have been carried eighty feet deeper, and the sildes would have been, in all probability enormously greater. The material will have to be removed, but outside of the additional expense, no ill effects are to be apprehended

The Budson and Manhattan Railroad Company is to be congratulated on having introduced some all-stee baggage cars for the transportation of baggage between the several steam railway terminatis severed by its gratem. The sides of the cars are provided with roller curtains. There are also folding aprons, which can be let down to bridge the span between the loading platform and the car. Eight loaded bagages trucks can be wheeled directly into the cars, an arrangement which eliminates much handling and trucking and fa cillitates quick leading and unloading the several steam railway terminals served by its

It has been determined that the sinking of the inited States floating drydock "Dewey" at Olongapa in the Philippines was due to an omission to closs the intake valves. Accidents of this character occa sionally occur, and one is reminded of the sinking of the "Texas" at the Brooklyn navy yard, which hap nened shortly before the Snanish American war. At her launching, the "Dewey," 500 length and 135 feet in width, was the largest floating drydock in the world She will probably be raised Intact

Asked for his opinion regarding the probabilities of the introduction in the near future of gas engines as a motive power for driving large steamships, Sir William Henry White, for many years chief constructor of the British navy, recently stated that in his opin ion the difficulty of high temperatures for the present effectually barred the way If this problem could be mastered as to its mechanical feature be possible to utilize gas engines of 20,000 b res, it might but the proposals to drive battleships with gas on "are so far only schemes."

The plan for opening a central avenue, one hund feet wide, between Fifth and Sixth avenues from Eighth to Fifty ninth streets which is being actively favored by Mayor Gaynor, would undoubtedly relieve ion on Fifth Avenue, to say nothing of providing the city with a magnificent thoroughfa through one of its most important districts. The esti-mated cost of forty million dollars, however, is proe other public improvements, such as subways, municipal buildings, and public schools, more urgent than this.

An extraordinary record was made at target practice recently by the new battleship "South Carolina," of eight 13-inch guns, which has been in commission the. Conswain J R. Edwards, 21 year old, who is in his first enlistment, made a record with the 19-inch guns in the vessel's No 4 after turret of 16 bull's eye target hits out of 16 shots in 4 minutes and 51 seconds. The hits per gun per minute for the whole 12-inch battery were 101, and 53 of 60 13-inch projectiles hit the bull's eye. Furthermore, three of the four turrets on the ship made 100 per cent of hits-

The advantages of oil over coal were illustratepa-ins a recent trip of the "Yika", one of the \$13-cap-pa-insigner advances which run between New York and Bootton The triple were on eitherstory that oil will be used exclusively on these shaps in the future. On-side of the absence of smoke form the funnals, is the complete abplitten of noise and dust fee to coul-lage. Formerly, the "Yika" bursed on a round trip \$35 time of cost, which took eight hours to get absent in future it will take only a hour for an oil berg-to gette hat. Che lishiya taplan the dishoft gallons of the which will have been dusty. The princi-gular wide, amounting to \$600 in nossis, is due to the local thair digital opisions of the work in the before tooks, where homestry forey-eight pickers were assess-ment. The advantages of oil over coal were illustrated

### ELECTRICITY.

In their tour of the Great Lakes this month, the members of the Chicago Association of Commerce will be able to keep in telephonic communication with their Chicago offices. Their steamer, the "Theodore Roosevolt," is fitted with a wireless telegraph outfit. and also with a telephone system which may be con nected with land lines at the docks where the steamer

The indirect system of illumination, which consists in casting the light of a lamp against a white surface. uch as a ceiling, and having it reflected and diffus thereby, is rapidly growing in favor. In order to make this system possible with the use of arc lamps an improved type of arc lamp has been devised by an n, in which the carbon-feeding me English concern, in which the carbon-resulting increases issue is placed below the arc. The result is virtually an inverted are lamp, and there is practically no ob-struction to the light passing upward except for the means of suspension from the ceiling

This fall the annual meeting of the Illuminating Engineering Society is to be held at Johns Hopkins Arrangements have been made for an tended course of lectures on the subject of illuminating engineering, immediately after the convention Thirty six lectures will be given from October 26th to Novem h, and facilities are provided for practical de strations and laboratory work in connection with the subjects taken up It is hoped that these lectures will result in a course of study in this branch of engineering orgraduate technical schools. It is realized that there is a scarcity of practical illuminating engineers

In Morway and Sweden the question of hydro-electric ration of power has recleved a great deal of atten tion from the fact that there are so many rivers in these countries capable of such development. Contrary to the custom in this country it is the practice in en to couple generators directly with slow speed turbines One interesting form of turbine generator consists of two whoels, the shaft of one passing through the hollow shaft of the other. The wheels turn in opposite directions, and one shaft carries the arma while the other carries the fields of the generator. This virtually amounts to doubling the speed of the gener-ator or reducing the number of poles Hydraulic thrust bearings are used At Korsnas, Sweden are four pairs of turbines on a single shaft developing are four pairs of troines on a single suart developing 420 horse-power. The fall is but six feet and the wheels make but 107 revolutions per minute. At Stangfjorden, in Norway, where there is a fall of 209 feet, a single wheel is used producing 3 100 horseet, a single wheel is used producing 3 300 horse-over running at a speed of 300 revolutions per

Mention was recently made of a continue stetho-scope and telephone relay, by which the heart heats of a patient in London could be heard in the Isle of In a paper read before the British Institute of Electrical Engineering, S G Brown the inventor described the construction of this relay 1t comprises a gap of 0 000,000,5 centimeter between platinum elec The current of a dry cell will flow across trodes. The current of a dry cell will now across this microscopic break, but any slight variations in this distance will vary, greatly, the current passing across the gap. The principal difficulty encountered was the question of preserving a gap of such micro-scopic proportions. It was evidently impossible to maintain the gap mechanically, but a system has been devised whereby the gap is automatically maintained by the current itself. Despite the delicacy of the adnt, the relay may be turned upside out affecting the gap With this relay the fluctua tions in feeble currents may be magnified twenty fold An Ulustrated description of this relay and stethoscope hitshed in next week's it AMPRICAN

The wireless telegraph station which has been re-cently erected by the French government on the Channel coast at Boulogue is of interest from the fact that it represents the first official application of the Bellini Tosi system of directed waves The new plant at Boulogue is operated by the French Postal and Telegraph department and is laid out so as to be Telegraph department and is laid out wo as to be operated either by the usual method or by the Sellini Tosi system. Accordingly the plant has an ordinary vertical antenna and an antenna for directed waves. These aerial systems are supported by four structural iron towers 155 feet high placed at the corners of a 260 feet mounter Four cables connect the tops of the towers, and the Ballini-Tosi autenna consisting of two groups of wires, is suspended from these of two groups of wires, is suspended from these factors group is formed of two vertical antenna converging towards the top, each having six parallel wires spaced il Seet apart. These antennas form a triangle with a horizontal section near the ground and two inclined wires. At the other the ground and we be specified with the advance are 300 bets again and the both advance are 300 bets again and the both advance are 300 bets again and the both advance are 300 bets again and the French stations of Salation Salation as working with the French stations of Salation Salation and Alpines posts.

### SCIENCE

Prof. Eduard Friedrich Withelm Pfueger, who died on March 17th at the age of 81, at the end of over sixty years of single-minded and unswerving devotion student of physiology, was best known to the scientific world by the 131 volumes of Pfiligers To that monumental publication many a dis ed scientist has contributed Pflüger himself nade a special study of the mechanism of spinal action made a special study of the mechanism of spinal action in the frog and the law of reflex action as studied upon the decapitated animal assons of his enricest investigations. His work on physiological consump-tion in living organisms has played an important part in our knowledge of the chemical respiration o

During the past three months the United States Weather Bureau has introduced a simplified form of ercial weather weather map, known as the 'commercial weather map,' for publication in the daily newspapers, and this now appears regularly in about forty papers This is an innovation of far reaching importance as it gives a much wider circulation to the information contained in the map than it has had heretofore While the matter is still in the experimental stage, it appears altogether probable that the newspaper maps will ultimately replace the maps now published by Weather Bureau stations throughout the country re suiting in a great saving of expense to the govern ment and the advantage to the public above mentioned

Prof Bronacher has studied the power of yohim bin to increase the flow of milk of cows and sheep The results prove that the yield of milk is increased during the administration of yohimbin, but the in crease is not sufficient to make an extensive use of solumbin as a galactogogue commercially profitable in the case of healthy animals. In the case of a row. yield of milk was diminished by an infla tion the disease was greatly mitigated by the treat ment, and an increased yield of milk followed. Many similar instances were observed. In no case did any injurious results follow the administration of the No experiments have yet been made on the influence of yohimbin as a galactogogue in the human species. In this case the question of expense is of less relative importance and the favorable results obd with animals appear to promise a s

The alloys of iron with metals other than those which enter into the composition of cast iron and steel have been little studied. In order to ascertain If any of these alloys possess useful electrical proper ties, Burgess and Aston have made a series of experi ments with alloys of iron with arsenic bismuth, and antimony The iron which they employed was ob-tained by the electrolysis of very pure Swedish iron The metals were melted together in the electric fur in a crucible of magnesia. The niloys were into bars which were subjected to various thermal treatments, and were investigated for magnetic p meability and hysteresis. The results show that the presence of antimony in iron always injures the me-chanical strength of the metal, and sometimes makes it worthless. Small quantities of arsenic improve the magnetic properties of iron and increase its electrical resistance. Bismuth produces the same effect but it must be added in larger quantities than arsenic

"The ann glows in the Lion save Sences meaning en the sun enters the sign of Leo, at the sum mer solutice the highest temperature of the year in enced We may say, on the other hand that the Babylonian astrologers thousands of years ago placed the king of beasts the flery and ferocious lion in that part of the zediac which the sun enters at the sum-mer solstice. The constellation which is called Leo bears very little resemblance to the outline of a ilon Probably the name was originally applied only to its principal star, Regulus It is to this constellation in the zodiac that we owe the countless water-spewing Hons heads, which are found in ancient and modern fountains, because in the latter part of July, while the sun is still in the sign Lee the Nile is at its highest level Furthermore the lions head with widely open jaws is in itself very suitable for the mouth of a fountain or water spout. This decorative mouth of a louncain or water spout 1 ms are oractive mostly was employed universally throughout the Greco-Roman world Lions heads are found used in the way at Athens Epheaus Ulympis Agrikentum, and countless other places It is not quite certain that this employment of the lion's head originated is Egypt, Curtius describes an Assyrian bas-relief from Bairan, showing water streaming from a ring-shaped vessel A lion stands as if on guard on either side of the fountain The water clock, which was used in judicial proceedings, bad the form of a lion and a name which means the guardian of the stream Hence the idea of protection may have been the origin of the association of lions with fountains, and this out-tom may have originated in Asia.

## THE OCEANOGRAPHIC MUSEUM AT MONAC

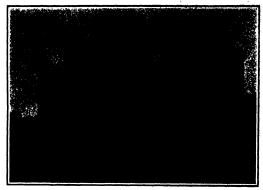
BY DR. ALFRED GRADENWITZ

The Prince of Monaco besides being the ruler of one of the smallest though most charming countries, one of the smallest though most charming courtres, has achieved fame in the world of science, has en-dowed his principality with a scientific institute unique in its kind, viz, an oceanographic museum destined to outsin not only the cormous collections brought home from his own voyages of discovery, but, generally speaking, everything relating to the investi-gation of the sea and its inhabitants, animal and

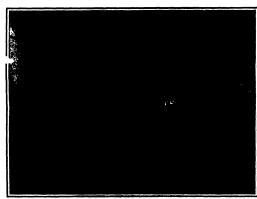
this museum which was solemnly inaugurated some works ago is situated in a site of surpassing beauty on a precipitous rock dominating the Mediter rancan, close to the famous St Martin Gardens thus rancan, close to the famous Ni Martin Gardens thus allowing of the installation of two basement stories, which up in immediately on the sea for the sake of certain scientific investigations. The foundation works of the building had obviously to be most clab orate, the more so as some of the pillars start nearly

unit, the more no no some of the pillars start nearly from the level of the new and the control of the sea. In building, 100 meters in length, is of a most imposing superance, and is a manterpleve from an arbitectural point of view Earn of its emonolith columns Nurters in bench, in 16 tons in weight Mork of the motives of devoration are derived from the frame of the ocean

When entering the ground floor, we are at first struck by the imposing mosaic floor, on which is represcrited -likewise in messic—the Princesse Alice, riant scientific cruises Everywhere around the half are seen ornamental subjects representing fis



The museum of Manage.



Skeletons of wheles, narwhale, and other ocean giants.

and other inhabitants of the ocean. On both sides a monumental staircase leads up to the first floor. After passing through a huge glass-paned door, we

enter a large assembly hall, 7 meters high, adorned with four beautiful columns of Brescia limestone, from the ceiling of which is suspended in the cents an electric luster representing a medusa, whereas each of the four angles is taken up by a smaller luster forming a glass sphere adorned with long prisms reminding of sea anemones, star fishes, and other radiata in front is seen a large status of the Prince, representing him on board his yacht searching the

The western hall is set apart for lectures, wall being taken up by an artistic painting re ing the 'Princesso Alice on an intensely blue and somewhat agitated sea. The eastern hall is taken up provisionally by sundry

ections of soological subjects and ocea instruments, but is destined particularly for the col-lections brought home from the Prince's voyages, which include the rarest and most beautiful speciness. In fact, the wonderful equipment of the Princesse Alice has allowed the sea to be searched down to a depth of more than 6 000 meters, while four expeditions in Arctic districts, beyond 80 deg northern latitude, have yielded specimens of the Arctifauna, suggestive of the most interesting comparison with those of the Mediterranean and the Norther

with those of the Mediterranean and the Northern Atlantic respectively Whereas these soological collections are housed in the right hand half of the hall, the exhibits on the (Concluded on page 489)

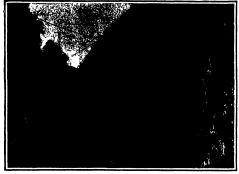


## THE NAM-TI BRIDGE

### A REMARKABLE NEW RAILWAY BRIDGE IN SOUTHERN CHINA

The Tunnan Ratiway Com The Tennian Ratiway Company is completing the construction of a line which will contect Londay, a frontier form of the French Asiatio possessions, with Tunnanou, the capital of Tunnan, and will be of great importance in developing the commerce of Indo-China and Tunkin the construction of this will have the result of the content of the result of the r The construction of this rail way through case of the next input; closed provinces of China has been greatly impeded by the climate, the difficulty of transportation and the hamman of the construction of the construction of the construction of the stream by mean of store vialuate was abandoned after few meantfactors reserved. streams by means of stone vinduculs was shandoned after a few unsatisfactory experiments, and it was decided to employ, as far as possible, steel bridges, of various types to smit local requirements, and so designed that they could be constructed in parts at the Batignolles works in Paris, forwarded to their destinations, largely by rail, as the line advanced, and quick ly put into place The bridge thrown over the Nam Ti River and the peculiar meth ods employed in its construc ogs employed in its construc-tion are here described and illustrated. At this point the river flows through a deep gorge between nearly vertical cliffs which the railway pierces by means of two curved tunnels, at a level r than 300 feet above the more than 300 feet hed of the stream of the cheem at this level of of the chasm at this level of the railway is about 220 feet. In these conditions the con-struction of a simple truss bridge of a single span would struction of a single span would bridge of a single span would have entailed much labor ex have entailed much labor ex pense and delay, owing to the necessity of working under-ground and of greatly enlarg-ing one of the tunnels in order to obtain room for the partial assembling of the heavy and deep truss re-quired. It was desirable, furthermore, to begin the conhermore, to begin the con-struction of this comparativ-ty large bridge before the railway had been artended to the gorge, in order to avoid any interruption in the prog-ress of the line Consequent-ity, owing to the entire ab-sence of wagon roads, the greater part of the account of the control of the con-greater part of the account of the mag machinery has been as on the backs of harles and on the backs of makes and men, in purcels not exceed-ing 8 feet in length or 178 pounds in weight. These con-signations determined the

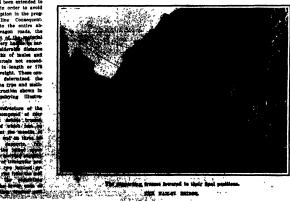
The House



Beginning the lowering of the supporting trueses



The supporting trasses lowered half-way.



on abutments constructed on on autiments constructed on artificial ledges on the walls of the gorge about 60 feet below the railway. The dis-tance between these about ments is about 180 feet but the total length of the super structure of the bridge

about 220 feet
The supporting trusses were shipped from France in parts small and light enough to be carried by men and mules, while the upper trusses, the pylons and the joint connecting the support ing trusses were sent out in eted sections of compara tively great size and weight which could be transported only by rail as it was de-signed to have the railway completed to the garge by t time the construction of the supporting trusses would be finished

The supporting trusses are attached to their abutments as they are to each other by movable joints. They we assembled in nearly vertice! assembled in nearly vertice' positions and their upper ends were subsequently to ered until they met Each of the supporting

trusses is communed of two single triangular trusses the planes of which are inclined symmetrically to the vertical at angles of 14 degrees These trusses are about 25 feet dis tant from each other at their tant from each other at their lower and outer ends and about 11 fect at their upper and inner ends. The straight bottom chord of each single truss is composed of two ver-tical plates about 2% inch liblek and 14 inches deep separated by an interval of 10 inches suitably connected and stiffened by L-bars angle plates The top chord, which forms a broken line is of similar construction but variable section, and is rein variable section, and is relu-forced show by transverse-plates about ½ fach thick. The truss is completed by pairs of light L-bars placed normally and obliquely to the bottom chord. The two single trusses of each sup-porting truss are connected by cross braces in the planes. of the normal bars and in the three planes of the bot

tom and top chords

The lower and outer and of each single trues is supor earn sings truss is sup-ported on a stone pier by means of a bill-and-socket joint of steel. The concave member of the joint is at tached to the truss the con-vex member is filted to the pier by means of a bed plate and adjusting wedges. The radius of curvature of the toint is shout 6 inches The joint is about 6 linenes. The upper and inner ends of the trusses are connected by hinge joints having pins of forged stael, 76 inches in di ameter These pins are per pendicular to the planes of the single trusses and consequently, are not horizontal but the amplitude of oscilla tion is so small that this slight inclination does not im pair the freedom of the

Although the weight of the bridge is sufficient to insure transverse stability in the strongest winds, additional resistance is given by steel

bars attached to masonry anchorages and to the rock.

The superstructure of the bridge is composed of two terminal spans 516 feet and 717 feet long, and two intermediate spans cash 482 feet in length trusses have a uniform depth of about 61/2 feet The floor beams which connect the top chords of the two single trusces are 16 inches deep and about 1/3 inch

The most interesting feature of the Nam-Ti bridge is the method by which it was creeted. Before the various parts of the supporting trusses had reached the tunnel nearest the French possessions a windlass and the could be read to be seen to be seen to be seen to be windlasses were joined together so that material suspended from the junction could be carried across the gorge by unwinding one cal winding up the other

The supporting trusses were partly assembled into a few large sections in the tunnels. These sections were then hoisted to their proper places in the trusses which were erected in a nearly vertical position and supported by the ball and socket joints at their lower ends and by temporary stays and timbers. The ter-minal section of the truss, including the socket, was minal section of the truss, including the sorker, was first placed in position on the ball of the joint, which was anchored securely to the rock. The outer halves of the upper chords with the ties and braces juty in their common plane, were next erected. The rectangular frame thus formed, which leaned against the cliff and was also stayed by ropes and timbers was then attached to the interior of the tunnel by two tackles strong enough to prevent it from being dragged forward by the weight and leverage of the remaining forward by the weight that overlage of its estimation parts as they were added, and to maintain the completed truss in its vertical position. This frame then served as a scaffold for the assemblage of the bottom chords of the truss and their attachments. In this cettion of the trues the bars which are perpendicular to the bottom chords were so nearly horiz they formed convenient supports for the few planks on which the workmen stood. After the bottom of the truss had been completed the inner halves of the top chords were assembled in the same manner some of their auxiliary parts being temporarily omitted in of their auxiliary parts being (emperarily omitted in order to lighten the lance end of the truss. The parts were temperarily joined by means of lather turned boils in order to seu the erreated possible preclaim, but the construction of the supporting trusses was not in advance of that of the railway that it was found possible to evidace most of the the by rivets before the truck that description. So the congorge Meanwhile in order to save time, a file of coolies, marching five feet apart, carried through the tortuous mountain passos for more than 12 miles, the two heavy chains, each

900 feet long, which were employed in lowering the supporting trusses to their final positions The other achinery required for this purpose, as well as the sections of the upper table of the bridge, was brought by rail

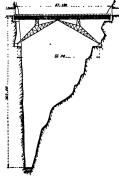
The lowering was ac complished by means of two great pulley blocks suchored to the face of the cliff above the tunnels and con nected by the two long chains with two simi lar blocks attached to the upper ends of the Thechains trueses were first drawn taut in order to slacken the temporary tackles at tached to the interior of the tunnels and allo their removal The chains were then slowly paid out, by means of windlasses provided with brakes, allowing the two trusses to turn around their outer ends

bascule drawbridge, until their inner ends came to-gether In order to facilitate this operation, both trusses carried sights at their inner end, and one of

trusses carried sights at their inner and, and ones of them, which was lowered a little after the other, hore both parts of the hinge joints by which the trusses were to be commonded. The omitted parts of the trusses were then added, a bed plats was conserved over their junction, and a pyton, which had been party assembled in frames of two peaks, which had been party assembled in frames of two peaks, which had been party assembled in frames

### Scientific American

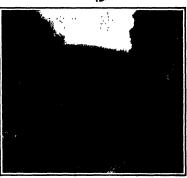
The upper table of the bridge was as continuous trues, in a straight and not very long ex-cavation in the first tunnel. As its construction pro-gressed it was moved forward with the aid of rollers greased at was moved forward with use ald of rousers placed on the two pylons and the junction of the supporting trosses until it had been completed and its forward end had reached its abutment on the opposite side of the gorge. The connections between the four spans were then removed. The construction of the bridge was commenced in March, 1908, and was



Side view of the bridge and section of the gorge with dimensions in meters

ompleted in November of the same year -G Bodin. in Le Génie Civil

At the Höganäs coal mines in the south of Sweden, states the Iron and Coal Trades Review experiments have been carried on for some time with the smelt ing of fine iron ore by means of Swedish coal These ing or one iron ore by invana or sweams coal. These experiments were at first conducted with a Gröndal furnace using coal of an inferior quality, for which it was desired to find an outlet. Later the chief director of the House coal mines undertook to conduct



The completed structure; the rails of which are \$81\(\frac{1}{2}\) feet above the river.

### THE NAM-TI BRIDGE.

the experiments independently, and it appears that he has now obtained favorable results, and that sufficient data have been collected to allow of stars are desirated and estimates being made. The owners of the Hopania coal mines—the Billisholm Arkitabolagania coal mines—the Billisholm Arkitabolagania coal mines—the Billisholm Arkitabolagania coal mass—the Capacity of 15,000 tone of fine item one per amanum. When this turnace has been tended in précities with the river of discovering possible faults, the intention is to event nine other furnaces of the spane often and

Marie at 1000

dy of the D

terpretation of the ch The physical in in the lines of the solar spe in the times of the source special position weather conditions shad by peasing from one to sandher point of the sun's disk, is still under discussion. Whilt-laker reques to attack any definits significance to changes of temperature occurring in the stormy solar atmosphere, nor does he admit that the peculiarities of spark spectra are characteristic of elevated temperaof spars spectra are characteristic of elevated tempera-tures. Electric Privation of alone may be excited in a coid gas, as is proved by the aurors. Whittaker at-tributes the observed changes in the spectrum to great pressure. On the contraction of the spectrum to great pressure, the contraction of the spectrum to great defend the usual interpretation, which attributes the changes to Jight temperature, radial velocity and the chemical action. Everyhelder, and admit that pre-sures much greater than atmospheric case that the sure much greater than atmospheric case after the sun, even at the bottom of the roses as greater. This epinion is based upon the sharpness of spectral lines in general But the hypothesis implies that in the sun

in general stat the hypothesis implies that in the sus prayitation is everywhere opposed by repulsive forces. Until recently the spectro-hellograph was applied chiefly to the lines H and K. Thus were obtained images of the floculi, those bright clouds of calcium images of the nocculi, those bright clouds of calcium vapor which almost cover the sites of the spots and faculs. Since 1908, following the example of Hale, the red line of hydrogen, which shows entirely differ-ent forms, has also been employed. This has led to the discovery of long dark diaments, which normally permist for several weeks, but which sometimes dissppear or change rapidly near very active spots Ac-cording to Designdres these filaments represent torus They are cially by the middle part of the line H a, which corresponds to the upper limit of hydrogen vapor marginal portions of the same line show dark fic

which are reversals of the calcium flocculi The photographs made by Hale, at Mt Wilson, with this same line, show the spots surrounded by cyclonic structures, which exhibit opposits rotations in the north and south hemispheres These spirals are far north and south hemispheres These spirals ar less frequently observed in ordinary photographs they be trajectories of material particles. The first evidence, furnished by Hale, consists in the doubling and the polarization of the spectral lines in the intere spots These phenomena suggest the circulation of electrified matter in a magnetic fie shed sought further evidence by placing the slit of the spectroscope across a spot near the sun's limb. In the spectros this case radial velocities in opposite direction ns should Instead of this he found on opposite sides of the spot however. Evershed found numerous and persistent indications of a tangential movement, always directed These results were obfrom the center of the spot tained chiefly with the lines of iron Possibly both

> different levels, the whirlwinds in a stra tum of hydrogen, the centrifugal flow in me tallic vapors beneath

Beechi, who discov-ered that the dark lines of the solar spectrum ome bright or versed in a narrow stra-tum at the base of the chromosphere during a total eclipse, contended that this reversal could rved at ordinary times Hale and Ada have confirmed his view by photographing reversed spectrum Their success appears to be due to the very delicate adjust ments which enabled them to keep the alit of the spectroscope accurately tangent to the sun's . The wave lengths of 184 of the lines were measured and wore found exactly equal to those of the corre ing tark lines of the erdinary spectrum. This perfect agreement could not be expected if, as



One of the supporting true as erected, in a verti

Julius suggested, the bright lines are due to the light of the photosphere, affected by anomalous dissertion.

To blacken light woods make a propersions of an ounce of hours, dissolved in a guart of water, with two connecs of sankins. The legal is then to be belief until a perfect isolation to obtained, clean salt; in you components of giventra, and complete by delighe a sufficiency of orbits sufficient black to assigned output the shade, which will you be belief or pro-ceived.

### Scientific American

### Correspondence.

### REDUCTION-GRAN TURBINE TRAIS To the Editor of the SCIENTIFIC AMERICAN

To the Editor of the SCENTIFIC AMERICAN
TOUR Article "A Way Out of the Marine Turbine
Disamma," in your issue of the 12th of February
places before the general reador throughout the world
as spech-making invention There can be little doubt as to its great value, and any discussion that h the proof thereof may be welco

You refer to the difficulty of ascertaining the actual horse-power of a turbine as a factor of uncertainty in the calculation of the efficiency of the combination, st that a reliable theck upon the results given is afforded by computations based on the rise of temperature of the oil. But the heat causing this rise of temperature is, at the same time, communicated to the large surrounding masses of metal, and the beat thus taken away from the oil should be calculated, if possible, or allowed for There is another way less open to que

uring the loss of power due to friction Laighte driven shaft be made the driver at 300 revolutions per minute by a reciprocating engine directly coupled thereto, so by a reciprocating engine directly coupled thereto, so that the pinion shall be driven it will then be easy to apply a brake to the pinion shaft, and ascertain the power transmitted upon a definite basis of comparison with the power exercised on the other shaft

The results of such a reciprocal test will not merely be "well within reason" but will convince the world will certainly be most satisfactory, but below an efficiency of 98 5 G STRICKLARD

Perth, Western Australia

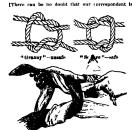
Pertn, Western Australia.

The Rafe E not in Case of Fire.

To the Editor of the Streviert Ampaira.

In your issue of May 28th, page 441 is a figure which would be liable to lead to harm if followed in case of fire The right hand upper illustration shows a "granny" knot, which is a loose or slipping knot The one which should be used is the "square' knot, in which the end and strand both pass below the loop, or both above it, instead of one above and one below as shown. The square knot will not slip

F H HALL



THE CORRECT WAY OF TYING

rect. The "granny' knot would be upsafe for the serious use to which it would be subjected in case of We therefore publish the foregoing diagram in order to correct any liability to mistake -Europ 1

### New Cometary The

Neither the comets seen for the first time in 1909, nor the periodic comets of Perrine and Winnerke which reappeared nearly in their computed places, offers any special interest Halley's comet reappeared in the position calculated by Cowell and Crommelin It was first detected in a photograph made by Wolf, at Heldelrg, on Septemb er 11th but was subsequently found on a plate exposed by Keeling on August 24th brightness increased slowly until the end of the vest its spectrum, first observed in December, showed the absorption bands of nitrogen and cyanogen, with inditions of self luminosity due to incandescent gases.

The past year is marked especially by the results

of the retrospective study of the spectroscopic and direct photographs of Morehouse's comet (1908 C). ves barely visible to the naked ove This com exhibited several divergent bright tails accompanied exhibited governl divergent bright talls accompanied by streamers darber than the sky, as if the space surrounding the conset were filled with luminous matter Shosequently, the tails bent and crossed, and Melotte observed a diminution of brightness at the point of intersection, as if one stall absorbed the light of the other Several times the tall appeared to break up into incide, which formed new surepopes and moved away from the head with increasing valority Comf successive photographs showed that tail opened and closed as if the whole sta

ture were rotating about a central axis. The stereo-scopic combinations made by Barnard appear to indicate the presence of talls of helical form, but Barnard suggests that this effect may be due to changes of form in the intervals between exposures. Crommelin observes that the apparent rotation of the talls may also be an illusion. It is sufficient to suppose that the head rotates slowly and projects particles rapidly in a plane which follows the rotation If the tails repre-sent the trajectories of particles, forces emanating from the head and from other points must co-operate with solar attraction and repulsion. The occurrence of four successive outbursts of activity sugg influence of a medium of variable constitution, formed by particles ejected by the sun and made visible by sage of comets, either by electrification or by the nar the passage of comest, either by electrification or by starying competary matter with them. This hypothe-sis would explain the presence of cyanogen and cer-tain other lines in the spectra of nearly all comets for this theory the apparent boundary of a comet's tail like that of a flame, would be simply the locus of a change of physical state

In the spectrum of this comet, E (' Pickering found tion bands corresponding to the principal lines of hydrogen At Meudon and Juvissy a faint con-tinuous spectrum indicating self-luminosity, was ob-served Designders regards the three pairs of bands as doubles, due to the Doppler effect and deduces for the cometary matter a velocity of more than 1,200 miles per second but the presence of a strong single line in addition, leads Campbell and Albrecht to resect this interpretation

### The Current Supplement.

A thoughtful yet popularly written article on Hered-ity by Prof W E Castle of Harvard University opens the current Supplement No 1797 The article shows that before any serious attempt can be made to im prove the human race considered as an assemblage of animals possessed of certain desirable physical and intellectual attributes it is obvious that we must know something about heredity in general and how, in pa ticular each of the desired physical and intellectual attributes is produced. In his article he reviews briefly some of the problems which the study of hered ity presents and some of the results obtained from their consideration —Sir William Crawford concludes his excellent consideration of Irish linens and their manufacture -Shelise or lac is one of those aids to civilization about which there has tended to (IVII) alton shout which there has reduce to be an almosphere of mystery and romance. Mr G Clarke Nugent removes much of this mystery in a strictly velentific account of sheliac and the lac industry—A Roce's instructive article on how to build a profile account the second of the se puppet show is concluded -A critical consideration of the Mailet locomotive in service is published—The chemical regulation of the processes of the body by means of activators, kinases, and hormones is dis-William H Howell of Johns Hopkins University —Mr William E Starks paper on Measuring Instruments of Long Ago is concluded —We are very apt to regard the tail of an animal as merely "the other end" of the body but Nature seems to early esteemed the member highly and to have made it her most efficient instrument of locomotion rious facts about these uses of talks are described by Mr James Newton Baskett-Mr W F Denning marizes our knowledge of the planet Mercury The usual Electrical Notes Engineering Notes and Trade Notes will be found in their accustomed places

### d: Information About Dishonest Po

The SUPETIME ANDREAS has always made a prac-The SUPTIFIC ALMAIGAN mas always made a prac-fice of exposing the snares and devices of the patent promoter as well as the fraudulent patent attorney Although the subject is by no means new to the read-ers of the Suptific Almenan it is one of whith all inventors should be thoroughly informed. The Editor of the SCIENTIFE AMERICAN would like to receive from readers of this journal, letters in which they narrate research or tinis journal, letters in which they narrade their personal expectinces with dishonest promoters and attorneys. Such letters will be published in due course and should not only be of interest in them selves but abould serve as a warning, thereby protecting others against such snares

Antique Siamese Bronse (Without Bronze Powder)

— I his is a greenish-black coating, with inlay of green
patina Rub chrome green and zinc white to a greenish white color with turnentine oil, mix with ian wint color win tirpeature on, mix wint color varnish and apply to the object, coating the hollow portions especially If there is rich decoration coat ints all over and dry Now rule green cinnabar graphite, and some black pigment to a greenish black color with turpontine oil mix with copial lacquer and coat over all the raised portions leaving the hollows untouched, so that the first layer in the hollow portions will have the appearance of copper oxide. Glase after drying, with spirit lacquer Handle the brush just as in ordinary bronzing

Biostruction is Ascenantian as the University of Paris.

A Chair of Accentation has been established at the University of Paris by M. Beell Scharcel, and is considered by Prof. Marchis, who has announced the programms of this course of sectures. The professor being by replying to the criticium that M Zaharcel's endowment would have been employed far more unfully for the development of certain averagation if some direct accommynament had been given to constructors. who are compelled to make very costly researches, to the brave aeronauts who risk their lives in the to the brave aeronants who risk their lives in these agregations. The ampirician which necessarily rules in the beginning of every industry should now be superseded by a methodical and rational interpreta-tion of observed facts. The object of this lecture course will be to expound as logically as possible the results which can fairly be considered as certain. Without extering into very record to theoretical con-Without entering into very recondite theoretical con-siderations, the lectures will still be far from "popu-lar" or elementary Finally, the development of the special seronautic library already possessed by the University, and the formation of a collection of small models of seroplanes and dirigible balloons, will supement the instruction given by the lectu professor will not confine his attention to theoretical professor will not confine his attention to theoretical speculations and laboratory researches, but will fol-low in dotall the experiments of constructors and the trial flights of aviators, noting in each case the prog-ross achieved and endeavoring to account for the

### Selenting American Prizes for Inventors

The SURVIVIC AMPRICAY offers \$100 in three prizes, to be awarded to the inventor who gives the best account of how he conceived his invention, how developed it in actual practice, and how he succeeded in selling it This sum of \$100 to be distributed as follows \$50 to the best account, \$35 to the second best account, \$15 to the third best account.

neer account, all to the third ower account.

There is no limitation as to subject matter of the invention In other words, the invention may be a household utensil, a game, a piece of electrical apparatus, an improvement in railway construction, a metal lurgical process, etc. The following conditions, h ever, must be observed

1 The invention must be patented

inventor must have actually sold his patent, and the invention must have been commercially in-

3 The account of the inventor's success must not be onger than 800 words.

4 The composition, letter, or article must be type-

written on one side of the paper only
5 The inventor must sign his offering with a pe

donym, and inclose it in a sealed envelope, upon which the pseudonym is written. A second sealed envelope must be provided, bearing on the outside the pseumym under which the offering is su mitted, and taining the real name and address of the contestant 6 Contestants must address their offerings to Inve-

tors' Prize Editor, Scientific American 361 Broad way. New York city 7 The contest remains open until August 15th, 1910

Judges will select the essays which, in their opinion, have won the three prizes and give them to the Editor have won the three prizes and give them to the Editor of the Schwitzir Alwait, and, with thereupon open the sealed envelopes containing the true names of the contestants, and notify the winners of the prizes.

8 The Editor of the Schwitzir Akmanan has the

right to publish the prize winning articles or letters

as well as those which may not receive prises
9 Unsuccessful letters cannot be returned It is
thereupon urged that the contestants preserve copies of their contributions

### elal Meteorological form ary, New York, N. Y., May. 1910.

ure Highest, 30 40; lowest, 29 46 Atmospheric pres Atmospheric pressure rigares, or so; forest, 79 %, mean, 29 % Temperature Highest, 51; date, 54th, lowest, 44, date, 5th, mean of warmest day, 71, date, 35th; coolest day, 52, date, 5th and 15th, mean of maximum for the month, 67 %, mean of maximum, 51.8, absolute mean, 60 2, normal, 59.2, average daily es compared with mean of 40 years, 09 est mean temperature of May, 65, in 1880, colder est mean temperature of May, so, in 1890, coldest mean, 54, in 1882 Absolute maximum and minimum of May for 40 years, 85 and 34 Average daily excess since January 1st, 24 Precipitation: 166; greatest in 24 hours, 085, date, 30th and 31st; average for May for 40 years, 818. Accumulated deficiency since January 1st, 138 Greatest precipitation, 910, in 1908, least, 033, in 1908 Wind. Prevailing direction, north-

## THE ALBANY-NEW YORK AEROPLANE FLIG

### HOW CURTISS COMPLTED FOR THE SCIENTIFIC AMERICAN TROPHY AND THE NEW YORK WORLD PRIZE



If the three attempts that have been made to fly from New York to Albany, or the person, first two were made last fall by dirigible balloons, and were unsuccessful, while the cently by an scroplane, and resulted in a brilliant prisewinning flight.

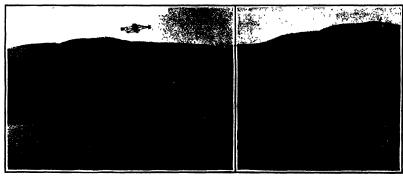
After making a number of flights over Lake Kenka, at Hammondsport, N. Y. and landing successfully upon the water, Mr Curties shipped his aeroplane to Albany and took a prespecting trip on the steambest from the capital to the metropolis. He found practically no suitable landing places on the river banks throughout the entire journey At Poughkeepsie, however, a mile back from the east shore, he selected a landing place on the farm of Mr W F. Gill Upon reaching New York Mr Curtiss gave notice that he would attempt to win the cash prise of the World state also the Somertruo Asimsona Trophy for the third consecutive time, which would give him the sup per-manently. He then returned to Albany to superistend mannuy. He cam recursed to annuy to supervisees the assembling of his hiphane. This was secondlikely in a test pitched upon Yan Renneclear Island, a mile south of the railroad bridge at Albany. A heavy rain caused delay in assembling the hiphane and kept the aviator from starting on Thursday, May 1862, while Priday the flight was impossible of accomplish-

the New York World, which so generously donated a prize of \$10,000 last summer for the per formance of this feat dur iornance of this feat dur-ing the Hudson Fulton cclebration afterward ex-tended the time within which it could be compet ed for to October 10th, 1910 Only a few weeks also after the exciting acropiane race of Paulhan and White from London to Manchester England, for the \$50,000 prize of the London Daily Mail It was decided to amend the rules and permit the mak-ing of two stops es route, while the time limit for the completion of the trip was set at 24 hours Ая soon as the modifications were announced, Glenn II.



Just before the start at Albany.

ment because of strong ment because of strong wind Early Saturday morning Mr. Curtiss went to the island. Everything to the island. Everything was in readiness for the flight, and the weather appeared to be perfect, but just as the aviator was about to start a wind sprang up, and he was obliged to again postpous. his attempt. Sunday morn-ing dawned bright and clear without any signs of wind, and after waiting till 7 A. M. to see if the wind would increase, Mr Curties started three minutes thereafter Circling to the north so as to pass within the city limits of Albany just below the railroad bridge, the aviator headed down the river at a 50 mile clip against a wind



The biplane passing over long Island, the government explosives manufactory.

Curtiss planing down the Hudson at 50 miles an hour.

Curtiss, the first winner of the Bennett cup race in France last year and twice the winner of the Scine tier AMERICAN Trophy, began experiments with a new and powerful biplane at Hammondsport N Y, with regard to landing upon water ite had al ready experimented last fall upon rising from the able to accomplish this. had attained a speed of 20 miles an hour with his small biplane resting on pontoons and daiven air propeller and 25 horse. power 4-cylinder Curtiss aeronautic motor It was therefore a comparatively casy matter to fit his new and larger biplane with cylindrical floats and an air tight canvas bag run ning the length of the wood strut that connects



THE ALBANT-NEW YORK ASSESSMENT PLANTS.

of 4 or 5 miles an h velocity He rose quite rapidly to a height of 1,000 feet, and followed the course of the river for 75 miles to Poughk As he came in sight of the As he came in sight of the railway bridge at this point, he was flying at an clavation of about 500 feet. He increased his height nomewhat as he neared this \$13-foothigh struc-ture, which he passed sev-eral hundred feet spens.

n, roro cie. After he and all, in order to re-jet, the tanks of his me before continuing althted a stop of one hour At 9:36 A. M. he re-started At 9:36 A. M. he restarted on his eventful flight and, souring out over the river, he headed toward New

York at a somewhat slower gait than before, owing to the curves and wind. During the balance of the er gait than before, owing journey, he maintained a height of from 500 to 800 feet. He did not fly as high as during the first part. since, in passing through the Highlands, he found that it was better to fly at a lower elevation Upon reaching Newburg Mr. Curtiss could see from the smoke that the wind had changed and was blowing from the west, or directly across his course. As the city was not great, however, this did not cause

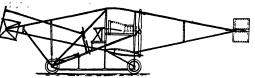
him any unearloses.

Som after passing Storm King, the 1,330-foot mountain that juts out into the river just above West
Point, the daring aviator experienced a sudden down
draft of air that caused the machine to drop so rapdeath of air that cannot the machine to drop so rap-ily that it seemed to fall away beneath him At the same time, it dipped at a sharp angle to one side, owing to one end catching more of the downward current. With great presence of mind Mr Curtiss directed his front horizontal radder sharply down directed his front horizontal radder sharply down which, of course, they were not when in a current of air traveling perpendicular to them This maneuer was seconsaftly, and he was able to right the machine Save for this once, he had no thrilling experiences the passed over found in the control of the course of the passed over found in the course of the course of the trip he followed the middle of the river. If of his trip he followed the middle of the river He made a practice, however, of keeping to the lesward side of the river as much as possible Thus, when Peckskill was reached, and he found that the wind had again shifted so that it was blowing from the receiting was researce, and he bound that the wind-ban sagain altitude that it would not a the wind-ban sagain altitude that it was always allo, and tol-lowed file altitude to always allo, and tol-lowed file altitude to the plant of the same of the to-source for a short distance in order to land upon to the was somewhat amased, upon landing, to find that what had appeared from his condestrable height to be level ground, was in resulty a fairly steep incline, so that it was necessary for him to jump out of his ma-chine the moment it came to a standardit, and to held it from sidings back from the hill. Alterward, when where there was a sharp terrace, and after making a stop of over an hour, he started off this terrace at a vory short run. The machine sourced of the terrace without dropping to any great extent, showing the possibilities of starting from a cilif Mr Curtiler's second stop was occasioned by the dis-

possibilities of starting from a cilif Mr Curtisa's second stop was occasioned by the dis covery that his lubricating oil was almost gone By landing upon the north end of Manhattan Island, be would accomplish the flight from Albany to New York insiding upon the north end of Manhattan Island, be would accomplish the flight from Albany to New York with but one stop, while two were allowed. Therefore, so as to make sure of winning the presence of the state of the speed was, over the course followed, 53% miles, so that the speed was, dys miles an hour The remained in this second state being made at 11 d 3 M makes, the state of the other the order of the state o

the are not to m da titte

Scientific American



wing relative positions of planes, radders, etc. Side elevation of Curties biplane, ab



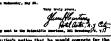
The Scientific American Trophy, the first prine over offered for successful flights with heavier-than-air machines.



an Trophy, under the roles for 1850 It is my intention to start on a cross country flight from

I will use a Curtise perceione of the follows weight 950 lbs.; surface area, 536 square feet; motor 50 % P. e, unter couled; longest time the markine has be rated to one fileds 20 plantes.

If there are any feet o



Nr. Curties's notice that he would compete for the Scientific American Trophy.

than those that were actu-ally used, which were about 7 inches in diameand 7 feet in length in several of the photo graphs, showing the bi plane in flight, these floats can be seen projecting from the back of the lower plane Together with the plane Together with the air inflated bag streeted along the lower runner, they had sufficient buoy ancy to keep the machine

from sinking should Mr Curtiss have been compelled from slaking snouth Mr Curtiss have been compelled to alight in the Hudson. An examination of his ma-chine showed that the oil tank had sprung a leak and had he not had an indicating gage constantly le-fore him he would not have known that his supply was rapidly diminishing, and thus he might have had

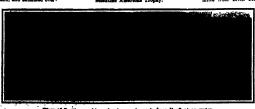
The biplane with which Mr Curtiss accomplished his epoch-making flight is very similar to the machine with which he won the Bennett Cup last fail at Rheims. It differs from the latter in having some-Aneims. It divers from the latter in having some-what larger rudders and balancing planes, and also in the extension of the upper plane 30 inches boyond the lower plane at each end of the machine. This differential plane idea was first tried a short time ago by Henry Farman, and was embodied in the machine used by Paulhan in his flight from London to Man chester it tends to give the aeroplane a certain amount of inherent transverse stability. The total supporting surface in the main planes is 236 square supporting surrace in the main planes is 2.56 equire feet, and the weight of the machine complete is 950 pounds including aviator full and oil As a re-sult of this the weight carried per squar foot of supporting surface is 402 pounds. This means that the machine must travel at a speed of 40 miles an hour along the ground before it will lift in order to attain this speed, a powerful 8-cylin der motor of 90 horse-power is used. The 7 foot diam eter, 8 foot pitch propeller mounted upon the engine ster, a foot pitch propetter mounted upon the engine crankshaft makes 1,100 R PM while the machine is in flight, and gives a pull, when the machine is held stationary on the ground, of over 300 pounds. This is, we believe somewhat better than the thrust obtained from the Gnome 50-horse-power motor used by Farman and others in their seroplanes The longest flight which Mr. Curtiss had formerly

made with his new biplane was a flight of 38 minutes duration above Lake Keuka at Hammondsport, N Y, in his try-outs of the machine. The greatest care was taken in re-assembling the machine at Van Rensselaer taken in r-assembling the machine at Van Mensenser Island, to see that all nuts were projectly washered, cotter pinned, and covered with varnish, so that they would not work loose Bome idea of the strains that must be undergone by a machine in flight can be had when one learns that Mr Curtise's bipliane was said. dealy dropped 40 to 50 feet while in flight, by downward current of air mentioned, and then quickly made to support itself again by a dive of considerably eater length. One reason for the success that the Curtiss machine has met with is undoubtedly the and strong manner in which it is put tog-taer. There and arong manner in which it is put by the are no bent struts and loose guy wires, such as we have noted in one of the well known foreign biplanes that was recently brought to this country, but every thing is put together in a thoroughly workmanlike manner, and consequently there have been no acci

In making his great flight, Mr Curtiss also com In making his great night, Mr. Curtass also com-peted for the Silverinic Austra A. Trophy, which is to be awarded this year for the longest cross-country slight. The first record for 1910 therefore stands at 74% miles but it is probable that this will be length ened considerably before the end of the year

The average speed made by Mr Curtiss from start to finish of his flight from Albany to Manhattan Island — 1 distance over the course followed of 128 miles—was 50% miles an hour Including the final leg of 14% miles from 207th Street and the Hudson Riv

Governor a Island (142% miles) this average falls to 49 14 miles an hour The actual air line distance be-tween the starting and finishing points is 13634 miles, so that using this as a basis, the average speed from point to point was but 4701 miles an was but 4701 miles an hour, which is the same as Mr. Curtiss averaged in the Bettiett Cup race at Rheims. As he no doubt covered more than 136 1 3 miles, it seems his new machine is faster than the Rheims racer with which Hamilton is making flights



View of Curties machine showing posteons to keep it alloat on water.

. THE ALBANY-WHY TORK ARROPLANS PLICET.

### An Aurial Torpedo.

One of the most remarkable demo natrations of the s of 'wireless has been made in London possibilities of 'wireless has been made in London last month, when Mr Thomas Raymond Phillips a Liverpool engineer, conducted a series of experiments on a small scale with a dirigible balloon entirely manipulated and controlled from the earth These tests were made at the Hippodrome one of London's tracest theaters M Phillips employed a dirigible on the line of the Zeppelin but only 20 feet long The model complete weighted about ten pounds and the serosint was filled with hydrogen

During the demonstration the inventor stood on the stage of the theater while his machine maneuvered about over the auditorium. He had by his side a keyboard semething like that of a typewriter but rath larger, and in reality composed of a number of push switches, above this was a small transmitter similar to that used in ordinary wireless telegraphy mercly pressing the keys Mr Phillips she ed that he could make his dirigible do anything he liked would press a switch over and the machine would promptly rise, the actuation of another key would produce a descrit Forward and backward motion was also obtained with perfect certainty as well as

circular flights and point to-point voyages which involved very in tricute steering. The experiments lasted some hours but never once did the model fail to do what the inventor had announced it was The most effective demonstration however, was that in which the uses of such a ma chine in warfare were shown The car of the dirigible had a trap door floor under the control of door noor unner the control of the operator who after maneuv ering the machino over a certain spot, opened a switch which caused the trapdoor to open and allowed a number of namer lumbs

The mechanism of the invention is extremely simple and one that could be made purfectly re-In the car of the balloon are a number of coherers suited to different electric wave lengths, and these control small switches and these control small switches which put into and throw out of action two sets of propiliers the trapdoor, and the system of lamps whereby the sirship can be lit up when desired. The secumulators for working the propellers and lighting the lamps are car ried in the car. The directional control of the airship is effected in a horizontal plane by a pair of propellers hung out from each e car on outriggers simi lar to those of the 'Zeppelin Either or both of these can be driven, and they can also be reersed (ither singl) or together so that the machine can be steered to the right and to the left kept in a straight course, or reversed back in its own tracks without turning round

Two horizontal propellers our siderably smaller than the driv ing screws are also attached by iggers to the nacelle,' and provide the means

for control in a vertical plane. The machine is so balanced as to be approximately equal in weight to the air it displaces consequently, when the horizontal propellers are not working it neither rises but can be made to ascend or discend by putting then in motion. Thus by using one vertical propeller an the horizontal ones the machine can be caused to more in a spiral path, and by cutting out the vertical s it can be made to rise straight up

The switches whereby the machine is controlled after the wave length of the electricity produced at the transmitter, all the coherer switch ship being tuned to different wave lengths.

The demonstrations have been so successful that the British War Office have investigated the matter, and it is understood that they have taken the invention up. At any rate trials with a full sized machine ar shortly to be made and if these are successful the invention will be bought by the government. The dimensions of the full sized war machine will be 60 feet long and 6 feet in diameter, and it will be capable of carrying nearly a couple of hundredweight of ex-plosives while its radius of action will be well over 100 miles Its speed will be about thirty miles p

### MR. EDWIN COULD OFFERS \$15,000 TO THE SUCCESSFUL DESIGNER AND DEMONSTRATOR OF A SAFE MEAVIER-THAN-AIR FLYING MA-CHINE EQUIPPED WITH MORE THAN ONE MOTOR AND MORE THAN ONE PROPELLER.

The fac-simile letter of Mr Edwin Gould, printed on this page, in which \$15,000 is offered for the best successful heavier-than-air flying machine, driven by more than one motor and one propeller, speaks for it It may be pointed out, however, that Mr Gould. ering his prise, has been moved by other con siderations than those involved in a sporting contest. Races, long-distance flights, speed tests, and other record breaking performances, have no doubt done much to bring the flying machine prominently before much to bring ton ping maschine promisently better the public, but it must be admitted that, besides whet-ting the natural human appetite for competition and driving home the truth that the flying machine is destined to play an important part in future human

It is Mr Gould's primary intention to furth naulic invention and with that end in view he offers a prize not for the fastest flying machine, but for a Receipt hinds of the bun.

The six ear be statled with comparative case out by the possessors of small infeccess, consequently the announced theoretics, are numerous; but astronome are constantly placing their chief reliance on the statled

cal results of pre ciae mes and long-continued observations, and they do not accept the physical theories advanced until after a accept the payanean incorress extended which nave been admitted and used for many years are not exempt from criticism. Thus, the elements of the sun's rotation determined by Carrington fifty years ago, which are still used in the reduction of the photographs taken daily at the English observatories, have been cancer can't at the angulan observatories, have been called into question. Turner has examined the measurements made by Peters between 1860 and 1887, which all the gap between Carrington's work and the Communical Advances. which all the gap between Carriagon's work and the Greewich photographs. He reaches the supprising conclusion that the sun spots of the northern and southern hemispheres revolves about two different axes, which make with each other an angle of 8 min-tise. The spots appear to be affected by a general drift which changed direction about 1385. The hypothesis of a placetary influence on sun

The hypothesis of a planetary influence on sur-spots has been often discussed and generally rejected In its favor, however, may be cited the proved fact

that the last maximum in the number of spots which was an-nounced for 1905, was delayed nearly two years, and that this retardation had been predicted by Brown as a consequence of motions of Jupiter and Saturn

lar activity gradually ed in 1909, as had been experted Nevertheless, a group of spots remained visible from Noember, 1908 to April, 1909 group which appeared in Scotem ber 1908, was found to be con-nected with a violent magnetic storm Lockyer's photographs made with the spectroheliograph, show that the principal spot was gradually obliterated by clouds of calcium which exhibited a cyclonic fore the structure thirty hours be maximum of magnetic disturb-ance Mitchie Smith observed that an extraordinary outburst of activ ty in the same spot was quickly followed by violent and projonged agitation of the magnetic nee This group of spots affected the earth's magnetism in four su cessive revolutions, in two which it produced two distr ances at intervals of five days This fact suggests the influence of two limited and divergent beams analogous to the double talls of certain comets.

intervals of 27 or 28 days, is well established for magnetic storms and aurors: The question has and aurorm been asked whether other terres trial phenomena do not similarly show the influence of the sun's rotation From the reco cyclones in the Indian Ocean, Maunder finds that an interval of

28 days is of common occurrence The first results of the total ecl'pse of 1908 have been pub-

lished. The report of MacCloan's expedition may that the corona exhibited the character, usual at intern ate epochs, of great extent in the middle latitudes, but that it was distinguished by certain features from all previously observed coronas. The coronal rays or streamers showed no connection with the protuber-

GiLouis Southwestern Railway Company! Often of the Presidents Post Broadway; New York suns 2, 1910.

affairs, such contests aid the art but little

To the Editor,

The Esientific American,

New York City.

Deer Stri-

In order to promote progress in aviation, I offer through the Scientific American, a prize of \$15,000, which is to be given to the inventor who designs and demonstrates in this country the best heavier-than-air flying machine equipped with more than one propeller and with more than one independent motor, in such manner,

that the motors can be operated together or independently.

My objet on offering the prize is to encourage the invention of a heavier-than-air flying machine which will be able to continue in safety on its course, even though one of the driving devices should break down.

In order that the efficiency of the inventions may be thoroughly tested, it will be necessary to subject them to endurance tests of stipulated length of time or distance.

Full conditions governing the award of the prise will be announced in a later issue of the Scientific American,

very trus yours, lain Touth

MR. EDWIN GOULD'S OFFER OF A \$15,000 AVIATION PRIES

type of flying machine which has thus far not been constructed Absolute safety must certainly be attained before a flying machine can over become even a popular vehicle of pleasure, and the attainment of safety is the chief object which Mr Gould has in view The conditions which will govern the novel contest

which will be inaugurated by Mr Gould's magnificent offer have not been decided upon as yet. They will require deliberation It is hardly likely that we shall he able to publish them for three or four weeks. In the meanwhile, the Editor will gladly consider any suggestions which the readers of this journal may make so that conditions may be drawn which will be fair and which will best serve the object of the prise.

Kinetic energy is the power stored in a moving ob ject which keeps it in motion By way of illustry conceive a railway train rushing along a straight, level stretch of track, the train being driven to its power stretch of track, the train being driven to its power limit if the source of power, say the steam pressure, is now suddenly removed by closing the throttle, the train will continue to run or "coust," for a long dis-tance, due to its kinetic energy, gradually reducing in speed until the energy is exhausted and the train

The United States during February produced pig iron at a rate which equaled 31,650,000 gross tons per annum During January the rate was about 31, 000,000 tons, and in December about 31,450,000 tens. 000,000 tons, and in December about 31,450,000 tens. In commenting on these figures, the Iron Age considers it is questionable whether the February rate will be maintained during March, since the daily on pacity of cole and anthractic furnaces is use at the pacity of colo and anthractic furnaces in use at the septiming of the month was fisht tom, whereas the daily rate of production for Pedromary was shifts from: "It is hard to realize," the journal remarks, "that in February the production was more than 40 per obte above that of Pedromary of Lat year, and nearly 3.73 times that of Pedromary two years ago, and yet that no little metal is presente on the market. It is not surprising that a question in ruised of the shift for of the country to showed ping two, at the present rate throughout the years."

## fone it, igio.

## DR. ROBERT KOCH, THE FATHER OF PREVENTIVE MEDICINE

BY JOHN B. HUBER, A.M., M.D.

Dr Robert Koch died on May 17th list. To estimate the value of his work, we must consider how humanity suffered from disease before his time Before the beneficent inoculations of Jenner, ep-

suffered from disease before his time
Before the beneficant incontinuous of Jenner, epdemics of smallpox devastated wat regions, decimating
cities and wiping out whole towns and villages, hashy
every wayfarer one met was a pock-marked servivor
red devadrability. To go no further back—an
epidemic of it was the last of those seren plagues that
afficted Egypt. Those 50,000 larselities and Philistimes at 38th-58mens, and those 70,000 others were
destroyed by the microscopic Beofities pestis Before
and since the Trojan war (in which this germ did its
greatest execution), throughout the middle ages, and
indeed up to our time, scores

indeed up to our time, scores of epidemies of the bubonic plague have wrought ghastly havoc One of these, the Black Death of the fourteenth entury, destroyed most miserably (so Gibbon computed) one-fourth the population of the then known world

the state of the s

Consider finally tubercu losis - consumption - which has probably always afflicted mankind At any rate Hip-pocrates twenty two centuries are wrote of it as the disease the most suffering and the greatest number of deaths The dreadful infections here mentioned, though more grue somely picturesque in their ravages, have been dwarfed by consumption. In the nineteenth century fourteen mil lions died in war, by bullet and steel and camp diseases during the same period thirty millions succumbed to consumption From time immemorial every third or fourth adult—in some communities every other adult— has succumbed to insidious phthisis We whites have in-troduced this disease among negro "brethren," who die of it in greater numbers than we do, and among our India: "wards" who are fast disar

postring by reason of our the borelooks, added and aborted by our "five water." Who has not, either in his family or among his friends, had to sudure some experience of the "Great White Flagues"? Think of it! Between adolescence and the first/dith; year, in those years when young me and young woman contemplate marriage, when wives should be strong to multitain their homes, when we should be strong to multitain their homes, when we should be strong to do the world's work. In those most previous years tubercelosis has throughout to conturned head calabating every first of fourth of tour conturned the state of the strong the strong of the strong the strong of the strong the strong of the strong o

factor as it had been a death dealing infection, every year our nation alone has been sustaining by reason of it a monetary loss of more than a thousand millions of dealers.

Reflect upon all these things, and then turn the mind to the year of Koch's birth—1843 In that year Pasteur entered the university

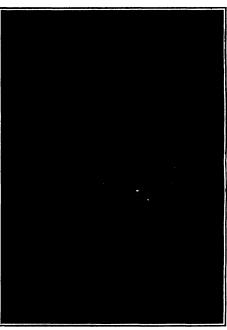
And let us premise here that in science great names have relandmarks, and the owners of these names have traversed and gisaned in the fields where many advoted and how forgotten laborer has delwed and sown and perhaps sweated blood. It should indeed, be comfortable observation that in sevence at least no man works in vain Full many a one has given his whole lift for establishing a fact, or indeed only an

of the earth, Koch clearly demonstrated how this business was to be gone about. When Koch was seventoen he persuaded his father

When Koch was seventoen be persuaded his father to get him a mirrescope Pussessed of this most congenital companion, he set about perferring other tochrical means of investigation For even gentle cannot work effectively without good tools. After at taking his decentrate in medicine he because a simple country dector, utilizing the time whith—nourrind to exceed the set of 
deeried, yet it is amaxing how frequently gentus, burn ing unquenchably in the service of humankind has man aged to get along without them, how they never avail at all in the absence of the right man.

But soon the German government became cognizant of Kochs writings. That government recognises good work; it avails itself of ability, it ongaged Koch in its service

It 1882 came his truly ochal discovery of the tubercle bacillus, the ess tial cause of tuberculosis Here was laid down the sure and scientific busis of the anti tuberculosis propaganda which has since been so suc cessfully waging Upon this measures intelligently formu lated and with wonderful result up to our day In Prus sia (Koch s own country) the consumption mortality been reduced forty per cent, in Boston, forty five per cent. in New York city fifty per cent in our northern (illes twenty per cent in the years of 1901-6. And it is being confidently predicted on the basis of the prophylaxis thus far achieved that our chil dren—ves, even we in this generation—may see this dreadful scourge of the cen turies all but eliminated from human experience Koch elaborated various tubercu-lins diagnostic of tuberculosis, their curative properties have unfortunately proved disappointing yet they were the basis of the derfully effective anti toxing of diphtheria, telanus (the most agentzing of all diseases of which formerly nearly all the sufferers died) meningitis pneumonia, and other dreadful infections



DR. ROBERT KOCK

them to a feet, his inclusity unrecognized, ridicule and even persecution oftentizes his most compensation, the many recognization of the particular description, yet his life and his works have been absolutely essential to the universal scheme. There is the human unit, and there is the welfare and the very existence of the work. Which latter were impossible without the self absent ing labors of the individual. Nor does it in any wise detract from the gratitude due the great man, that he had profited by the labors

Nor does it in any wise detrect from the gratitude due the great man, that he hat profitted by the labors of others, adding what he can of his own, scruliniting every detailed datum in the whole fabric permeating and illuminating it with his own mind, and extracting from the mass the mighty deductions of genius. Thus did Jenner's inoculations, upon the principle of fight ing flav with fire, maste clear the way for Davision and Laiser and Pasteur, upon whose subtructures Koch built. These latter developed the germ theory of disease, Koch made of this theory the science of bacteriogs, which is bady the most potent factor in civiliastices. Pasteur declared it to be within human power to hands all parasticle diseases from the face

And Koch s achievements in tuberculosis were only a

part of his service to maintind. In 1888 he discovered he cholers have fullers which in responsible for that disease. In the investigation of other words our greaters amove bubonic plague septiceming. Holoop phonologi, to pursoomisals cattle plague, anthrax malaria—Kock's part has been most vital, either as discover or as originator or developer of prophylaxis and cura tive methods

He showed how mainria could be absolutely van quished by stampling it out of the island of Brien in the Adriain, under commission of the Adriain was described to the Adriain was a state of the Adriain with the matshand. There Koch discovered the cross-division by the Adriain was a state of 
## The Collection and Preservation of Moths and Butternie

BY FREDERICK M. SCHWERD

The most beautiful members of that very large 200logical class termed in ser in are butterflies and Because of their beauty they have siways heatity they have always reviewed more or less at tention from collectors soung and old Many have started to gather these insects, but because of lack of the knowledge of how to preserve them their so-called collections have spoiled, and the speci mens have become broken and moth calca. In the following words I shall en deavor to describe, with out the use of scientific terms a method in which to preserve their captures, and which gives such pleasing results that the finished labor will be a source of enjoyment both to the collector and his

The specimens must be caught before being pre served therefore, it will be most convenient to be gin with a description of the primary requisite for

The Net.—The frame or rim of the net is easily made from a piece of iron or telegraph wire about forty-two inches long This wire is bent in the form of a loop, leaving two straight ends, each about straight ends, each about four inches long, in the manner shown in the illus tration 1. Some sort of rod must then be secured. broom handle answers this purpose very well, but a rod about an inch in diameter and five feet long can be procured at any lumber



COLLECTION AND PRESERVATION OF MOTHS AND BUTTERFLIES

# with staples or wire wound around. (See Figs. 3, 4. around. (See Figu. and 5) Only the making of the bag remains. For this purpose taristan proter fine netting of a brown or green color should be used. Mosquito netting is rather course and should not be used, as it scratches the wings of the innest. The home of the insects. The hag should be about twenty inches deep and the bot tom rounded as in Fig. 6 It may then be attached to the rim by means of tape How to Kill the Insect -When the insect is flut-tering in the net, the ques tion arises how to kill it painlessly and quickly This may be accomplished in several ways. Most col lectors use a cyanide bot-tle, which is prepared in the following manner In to a wide-mouthed glass are placed a few lumps of are placed a few lumps of cyanide of potassium Up-on these is poured plaster of Paris to the depth of one inch When the plas-ter is dry the bottle is-tightly corked, and must not be left uncorked. The body of the insect is gently

body or the insect is gently hold between the thumb and index finger (7) and a drop of chloroform is dropped upon its head from a vial carried in the pocket. The insect im

mediately stops its flutter ing and may then be taken from the net and placed (Continued on page 490.)

## BERTILLON AND THE BURGLAR'S "JIMMY"

BY JACQUES BOYER

The police officer or magistrate engaged in the eluci-The police curve or magnetize engages to one execution of a crime, endeavor to collect as many exact facts as possible and the more methodically he seeks werlifes and gives a logical grouping to his vidence, the greater is his chance of discovering the true cause and the perputator of the crime.

M Bertillion, the celebrated chief of the anthropo-

etric service of the French police, has recently invented a dynamometer of special character, which will facilitate judicial investigations by furnishing exact measurements of the muscular efforts which are manifested in the violent entry into a house, room, or desk, and by making it possible to reproduce the traces of his work which the burgiar has left on doors

and articles of furniture. The apparatus consists of a sized frame, which is attached by server to a wooden table it contains a lower plate which can more for-ward and back, two internal uprigates attitued by curred brace, and a cross piece of riche attached by strong boils to the tops of these posts. This frame carries Concluded on apage [47]



The Sertilles effraction dynamome-ter—a mechanical detective.



Impremions of the three fundamental types, showing the force in kilogrammes required to produce each.





A MEGHANISAL RUBGLAR DETRUTOR.

GAS WATER MEATER FOR ELTORER SOLLEGE

THE COLUMN ASSESSION.

The of the chief drawbacks of the gas kitchen range, in the problem of maintaining a suitable hot water supply. A small nester attached to the kitchen between the country of the companying the state of the chief will rescond the truth. The accompanying the state of the country of the chief water of the fact of the chief water of the factor it is pool necessary to heat all the water in the tolder, as is the case when it is considerate in the following and the chief water in the follow, as is the case when it is considerate. water in the boiler, as is the case when it is connected with the kitchen range in the usual way, but only such amount as may be required for the time being The heater as illustrated in the vertical section, Fig 2, The baster as illustrated in the vertical section, Fig 5, and cross section, Fig 5, donsids of a copper ofl, inclosed in a casing, with a gas burner in the center of the cell, and it is connected to the kitches boiler at the top and bottom. The gas burner can be made with or without a primer or lighter I can also be connected with a self-lighter to be operated with a push button in the unal way. Table as ordinary tinned copper tube about one inch indimeter, and fill it with fine ead, closing the ends with stoppers. With a wooden mailet begin about 3 inches from each end to finten the pips, until it is

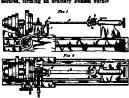
inches from each end to flatten the pipe, until it is inches from each end to natten the pipe, until it is 4g inch in thickness. After this, make a wooden cen-ter, say 6 inches in diameter, with one end tapering or rather rounded off. One end of the tube is now fastioned to this wooden center and the flat pipe is wound around the same, forming a close helix. The other end is then formed over the tapering end of the wooden center by hammering it into place with the mailet, until the colls begin to close up, leaving enough space for the spent gases to pass out. The end must of course be made straight and in the cen-ter so that it will enter the central hole in the casing

ter so that if will enter the central hefe in the easing or cover which is to be connected to the boller after the coll is made into the required shape, the stoppers in the eads are removed, and the sand made to run out by turning the coil around and tapping it lightly with the mallet. It may then be connected to a fancet and washed out with water The lower end of the coil may be beant at any angle to suit local

The externally threaded end of an ordinary % inch union is now alipped over the end of the coll which is peesed over, say about 3/16 inch, forming a fange which serves to connect the copper tube and iron pipe with the ordinary union. (See Fig. 4.). This

### Scientific American

The burner is made out of an ordinary nipple, with cape on each end. In the nipple are drilled a number of small holes. Insafe the nipple is a small from cylinder with conical bottom, and provided with a small finange at its upper end, where it is fastened between the end of the nipple and the cap The object between the end of the nipple and the cap The object of this cylinder is to partly fill up the inside of the nipple, leaving a small annular space for the gas and air to pass up and out through the small holes in the nipple. To the lower head of the casing is fastened an ordinary air regulator, into which the gas pipe is secured, forming an ordinary Bunson burner



SIDE AND PLAN VIEWS OF RIG FOR CUTTING A CONCAVE SURFACE,

The main feature of this heater is to introduce the water in a very thin, circular sheet surrounding the central heater It will now be seen that when the is is lighted the water in the flat coil be.c and starts to circulate around the fire up the spiral course to the top of the boiler The temperature of the

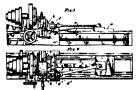
course to the top it the source. The temperature of the water may be regulated by inserting a valve below the ooil, but for ordinary use this is not necessary Fig 1 shows the complete bester connected up to a kitchen boiler with a vent pipe for the spent gases connected to the chimney

Fig. 5 shows how the heater may be fitted up with a primer, or starter for the gas, which is merely a small independent Bunsen burner, connected below the regular mixing tube This burner is first lighted, the fame will shoot up into the heater, the ordinary the primer may be turned off. This is only a matter of convenience in starting the hig burner, as a match or a taper will do the same thing

Fig 6 shows a system in which the heater proper is located in the basement and the supply pipe, instead of being connected to the boiler or storage tank, is near, or it may no connected to the water rancet. The apparatus is quite simple, it is only necessary to push a button, which will ignite the gas in the heater, and then open the faucet. The cold water in the pipe will run out, of course, before the hot water

### TURNING CONCAVE AND CONVEX SURFACES.

Some time ago the writer had occasion to make a pair of laps for grinding telescope lenses, and as this calls for very accurate work in order to get a true calls for very accurate work in order to get a true curre, it became necessary to make the attachments which are here described. In this class of work it is imperative that the ulmost care be given the construc-tion of the several parks, as upon the accuracy of the measurements and nicety of fit depend the quality of the flashed product. There must be no lost motion supwhere, as this would mean chatter marks on the

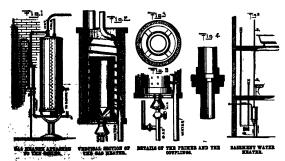


LATHE RIGGED TO TURN A CONVEX

surface of the work. For this reason it is better to use taper pine or boils as these will insure a clean felting joint, and the extra trouble will be more affected. The rigidity of the radius has in a vital in a large of the radius has the vital in a large. The rigidity of the radius has the vital in large. The rigidity of the radius has been a felting in the rigidity of the radius of the r to 24 inches, a bar % by 134 inch cross-section is none too heavy, while for radii of 24 to 36 inches 34 by 2 inches is of about the proper proportion

igs 1 and 2 show front and plan views respectively of the concave attachment. The radius block a h bored to make a close fit on the nose of the tail-stock spindle, and is provided with a tightening screw b for binding the block securely in place. It will be observed that the block is split where the tightening screw works. The lugs or ears which receive the radius bar are now finished on the inside, and the noies, for the pin or bolt d are drilled. Care should se used to get these holes directly in line with the dead center, it may appear that a slight variation on way or the other may be of no account, but it is A good merbank always adheres to the rule "Anything C is secured in any sullable manner to the tool post silde. As this part of various makes of lathes differs it is impossible to give a form of block to fit all but any good mechanic can devise means for securing one any good mechanic can devise incans for securing one to his lattle Regarding the radius bar ciltule can be said except the spacing of the holes. On the accuracy of this depends wholly the accuracy of the curve racy of this depends wholly the accuracy of the curve of the part machined Fig 2 shows the tool on a line with the center, in which position it is act before starting to cut. The fail stock is now clamped in post idea, while the lathe carriage should be free to move book and forth on the ways As the tool post side is drawn toward the operator the carriage will be drawn back, causing this cutting tool to describe an art the radius of which is equal to the distance between the centers of the holes in the radius bar The tool is fed to the work by turning the hand wheel of the tail stock screw while the cross feed is accomplished in the usual mauner

Figs 3 and 1 represent the device for turning convex surfaces, which is somewhat more complicated than the mechanism described above. The radius bar used for concave work can be used here but all of the other for concave work can be used not not not not not not parts must be inade especially for the purpose. The block of must be planed and fitted to the inner ways of the lathe and mounted in such a manner that it can move freely backward and forward. The silde d which carries the cross-slide block d' is securely boited to the lathe bed Boited to the sliding block d' is the to the lathe bed Boiled to the shining block at its the bearing at to which is secured the forward end of radius bar c On the upper side of block at is a roller which runs in the slot in block b the latter being secured to the tool post carriage. The lathe carriage which runs in the slot in block b the latter being secured to the tool post carriage. The latte carriage and block a are rigidly connected by means of the bar c, the front end of which may be belted to the bridge webs as shown by the dotted lines. The operation is as follows, bearing in mind that slide d is rigidly secured to the bed As the tool post side or cross slide is fed forward, the sliding block dt is carried with it by means of the slotted block b and roller ! As slid ck d' advances carrying with it the forward end of radius bar e, it becomes apparent that block a must move backward, and as this block and lathe carriage are rigidly connected by bar c the lathe carriage will be carried with it, the result being that the tool is a in a reversed are. It might be well



this as which each of the coll. Of course of the markly about he put out before the of factored to the coll. The coll is now in this paper of 8-inch store

The state of accesses to the others of the other of the other other others of the other ot

makes in appearance The temperature of the water can be requisited by the basest. That is to say, the greater the heat desired, the smaller should be the quantity allowed to run through the taseet, and over cores. When no more hot water is wanted the other betten in pushed, which routs off the gas and puts out he for the put of to turn on the fancet, without starting the fire Thus bot or cold water may be drawn from the same faucet at will.

Scientific American

to state that in order to avoid resetting, it is a good plan to have the blank which is to be machined cast with a convex face of about the same curve as it should be when finished if this is not done or we wish to use flat disks of cold-rolled steel or other metal it will be necessary to move the cutting too forward after each cut

### A SAFETY OIL CAN

A SAFETY OIL OAR

BY A JARREY

When oilling cleated and theory, it is always advischle to safeguard yourself against accidental shock,
cape-fally when currents of high tension are being



OIL CAN WITH INSULATED TIP

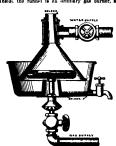
generated. It frequently happens when an or generated It frequently happens whon an ordinary long-long-upon ten is employed for cilling dynames that a sovere shock is received by the other, resulting sometimes in death 8 years 1 years ago the writer in vested an oil can that was perfectly safe sometimes or ordinary resolutions of use Osing to the extremo simplifits of the dwign any one possessing ordinary mechanical ability can convert an ordinary other mechanical ability can convert an ordinary other properties. either of the vertical or horizontal kind, into a safety ollor. Cut the apout in the middle and solder upon each end a piece of brass tubing having either an exsieeve made of insulating material as shown in the sectional view. The insulator can be made out of either hard rubber or vulcanized fiber turned in the enter many rubber or voluntation more turned in the lathe, with a milled center to admit of a firm grip when screwing or unscrewing the parts. Since oil is an insulator, no current can get past the coupling sleave to the oiler's hand

### IMPLANTAMENTA WATER HEATER

The old proverb, 'A watched kettle never bolls," does not apply to the water heater shown in the accom nanying illustration because hot or even boiling water an be drawn from it, the instant it is put into opera tion It is made from an ordinary copper funnel and a cake tin

The copper funnel should preferably be tinued on the outside To the water supply pipe is attach valve for the regulation of the flow of water To valve for the rigulation of the now or water 10 cms walve is filter do short nipple and an ordinary too fitting. One end of the arm of the tee is fitted with an ordinary plug which is borred and reamed out to fit the small end of the funnel and the end of same is turned over with a small hammer and soldered to the plug The other end of the tee is filed to fit very closely to the outside of the funnel, leaving, however, u slight annular opening which may be regulated by rerewing the blug in or out, so that when the water is turned on it will flow in an even thin sheet over the funnel

inside the funnel is an ordinary gas burner, such



ROME-MADE INSTANTANEOUS WATER HEATER.

as may be purchased for ten cents. This burner is connected to the gas supply in the usual manner. It will be noticed by referring to the illustration that the funnel is in an inverted position The lower part of the funnel is surrounded by an ordinary cake mold, with the inside cone partly out off. This tin forms a basin for the hot water which may be drawn off with an ordinary faucet soldered to the cake tin, or it may be run off as the water heats. It will now be seen

that when the gas is lighted the funnel bec at once, and when the water is turned on it is fo through the narrow opening between the tee and the funnel in a uniform thin sheet which spreads over the funnel and becomes hot as it flows down. Almost a degree of heat may be obtained by regulating the fi degree of next may be obtained by regulating the low of water with the valve. The spent gases from the gas burner pass up through the funnel and out to the atmosphere. Some arrangement may be made to con-nect the water and gas valves so that they will be turned on simultaneously, thus obviating the danger turned on simultaneously, of overheating the funnel

### STRAM BOXES FOR BOAT BUILDING. BY A. P RES

A simple method of rigging a steam box for boat work is as follows Take a common wash boiler, put work as shows a lake a common wash borner, put a 1% inch hole in the corer to receive a short ploce of tabing 2 or 3 inches long, which should be soldered. The stamn box is made of wood, of any length desired, and about 10 inches high by 8 inches wide inside Make a couple of checks hollowed out to fit the top of boller cover, and nail them to the box Cut a round



STRAM BOX CONNECTED TO A WASH BOILER.

le in the bottom of the box to receive the tubing that has been placed in the cover of the boiler Be careful not to allow the tubing to project inside the box The ends of the box are generally stopped up with old rags. In operation put about a pailful of water in the boiler fit the cover on, and then lift the



STEAM BOX COMMECTED TO A CAST-IRON MUFFLER.

steam box and place it on top of the cover, allowing the tubing to enter the bottom of the box

Another method of constructing a steam box has Another method of constructing a steam how has boon devised by William Elia, a beat builder. It is made by taking a cast iron muffer, plugging the lower end, and connecting a short length of 1½, inch pipe to the opposite end. At the is put on the end of the pipe with a short piece of 1½ line pipe served into the test right angies to the number piece. The upper and off the test is plugged up with a wooden ping, if here is no reducer handy

Bore a hole in the wooden plug, and screw into it a

store a note in the wooden plug, and screw into it a short plees of \( \frac{\text{Mort plug}}{\text{Mort plug}} \) exitted with a stop cock of some sort Abore the stop cock, place a can or wooden paint pail, which is quite easily attached by simply boring a hole in the bottom and servering to the short nipple above the stop cock in operation, the muffer is placed in the store with a coal or wood for a believe of short leave with a bule through which the muffler is piaced in the stove with a coal or wood for A piece of sheet from with a hole through which the pipe projects, serves as a cover for the store, water is poured into the paint pagi and allowed to steam how mounted on legs is connected to the muffler pite 1½ in the jupe 75th style of bolists into influence if the pite 75th style of bolists into influence in pat in This, of course, makes it "fashty," but otherwise no harm in does, as the pipe is of smillicent size to handle stall the steam that is generated. John W HAVE

HANDS MINES RESTS IN BASE SECTION.

A best dear in more exposed 16 serves stincts of the solution within any scher part of the book. The hole sunshine may be drying it up half the time, while during the other half, it may be covered with rein,



MARING TIGHT JOINTS IN BOAT DEGRA

as pretty a deck as a tight seam, made in the following

manner. Have the wood thoroughly seasoned and make a nice fitting joint for the deek plank that you are laying next to the plank abeer. When this is done, take the place out and with a smooth steel red or burnisher of some kind, burnish down, with quite a burnisher of some kind, burnish down, with quite a pressure, the correr of the joined edge, as in Fig. 2 of the accompanying drawing. This of course com-presses the wood Now plans the wood down on the jointed edge, making a true corner again. This is now raday to fasten on the deck carrilas Proceed in like manner with the rest of the deck plants. The joints on a wooden tank or wat can be made tight by the on a wooden tank or vat can be made tight by the same principle. Instead of burnishing the corner a round rod is laid in the center of the jointed piece and with a hammer is forced enerty half its diameter in the wood (See Fig 3). This is planed down until there is no grower left, each joint is treated in the same way. When the wood is moistened, the part that has been compressed by the round rod will expand This produces a very tight joint.

### TO PREVENT OBSTRUCTION OF THE PERD PIPE IN AUTOMOBILES.

Among the worst and most costly troubles of the amateur motorist are those connected with the piston, and if he is unable to discover the cause of the dis-order he may have to pay heavily for curing that which could be avoided by observing the folk simple precaution

simple precaution
Recently whon my engine failed to work properly I
determined to look into the matter myself, and started
by removing the cylinder heads I discovered amil
particles of motal around the edge of the cylinders and the cylinders themselves were arratched up. Transing this to its cause I discovered that the feed pipe was simust clogged up with small particles of corrodet copper. Going bruther, my passiline tank showed signs of corrosion which i attribute to poor gasoline, containing considerable mostster thereby causing corrosion of the copper tank. After giving my tank a thorough washing and excepting i had it electroplated inside with a coating of tin. All particles of metal were removed from the cylinders, the feed pipe was cleaned moved from the cylinders, the feed pipe was cleaned running my motor for the past eight months without the trouble recurring, and have swent unwait the coat. and the cylinders themselves were scratched up Trac the trouble recurring, and have saved myself the cost of

HOW TO DRILL A HOLE CRETRAL IN A BAR. It is a rather difficult matter to drill a hole in a bar and keep the hole central. The accompanying drawing shows a practical kink. A piece of tool steel



METHOD OF BRILLING A HOLE CENTRAL IN A DAR.

A is caught in the lathe chuck, and is turned and bored so the hole will wan true with the sentide dissi-eter. The continied dimmeter is turned the centre of bur 3, which is to be drilled. The bur 3 is placed in a view as shown, the drill get at placed to go or the job, and the view is then tightened up, and the gr and the bur are of the using diagenter, the place will had them both very rigidly while the her is be-13,400 13,56

Excitation 2 A. Beacter and O. H. This is the second of the color of the class of t

Billactival Bayless.

BILACKET POR TRIMINIONS BY THYRIFS.

If P Yoas, New York, N Y. The object of for invertee is to provide an attachment for a bilephane of the class which refers more particularly to desk telephones, which will enable the receiver to be adjusted to the car so that it will be supported in the proper position, which were provided to the car with leaving bursten to the carried 
or to make memorands of the conversation.

DENTAL FORCENT —R. C. LURIAMO. Ner

York N Y. The forevers are of that type commonty employed for the extraction of section

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### Of General Interest.

Of General Interest.

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P T RIGHT Newport, R I An object of the improvement is to provide a base which may be made of this cast the provide a state of the provide as the provide a state of the provid

shape

M NICAL INSTRUMENT—W II Danaux

BAN Haschkersk, Wis. The invention refers to

gramuphone. Means provide for connecting
the stylus with the bridge of the violin and

gramuphone. A stylus or needle is stitzhed
to a violin or a like instrument, and the latter
to a violin or a like instrument, and the latter
with a revolving record, no that the violin

forms the sound reproducer and amplifer

forms the sound reproducer and supplies CONCRETS WALL CONSTRUCTION —. Laysmonvenam, New York, N Y The salm in this case is to provide a concrete wall construction arranged to provide multiple for fastering floor frames have boards prefer to make the control of 
BAPFET Off ARD OR SUPPORT - L. B. Massen New York, N. T. The lowestion per-teins in guards for watches and the like, and the like, and the like, and the like an

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octimized located upon a fixed structure and higgely secured thereto.

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Menting and Lighting.

TARON BURNER.—A. H. Warrs. IR Panels before the control of the properties of the professor of the prof

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| K links 050 521   | linking ribbon, G T Rewton   | 200  | Curpotter of the second  | <b>PARTY</b>  |  |
| Rievator apparatus, P II Melander 1859 T78  | freelating muterial, making, W R. Seigle.  | ***  | Person transmission apparatus, P. O Horston  | 23  |  |
| Ing means for hydranic, S. O. Neal 030 750<br>Budwidery attachment R. W. Shockley 830 651   | muses comparing called to 1  | 900,005  | Procure regulater, J. R. Brewn   | 两河  |  |
| Rushroldery attachment R W Shockley BM 601  | Investor beard A D Williams  | 980,213  | coar coar  | 里撒  |  |
| Ragine starter explosive (i Borson 1973 1975)<br>Engine starter hydrocarbon (i Brisbola 1930 198)   | irrigating apparatus, ( Berill   |  | Printing mechine, M. R. Massa  | 23  |  |
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| Rugine starting device Collower & Salite hory under the properties operating explosive 1 1 timesee 950 to 1 Paravating machine ti W. King et al. 950 750  | kilin M. C-to  | 909,986  | Printing plate, Serbie, M & Droftener  | 33  | Date of the last o |
| Paphadosa or combination motor of joining, 4 A C W Hall Veplenter engine F J Woods Pyregiane monoling F J Minches Pary J H Chilman San Mary San Mar  | Kulting auschine bed W O. Wait   | 948, 423   | Competer Landschaft of "minder Present regulation. Delta B. Dallar   | 900,004   | The second secon |
| Producte ongine J. F. Woolf 850 866<br>Product mounting F. J. Strakes 850 816   | Labeling device bread, J Liuman  | 909 111  | Printing press about delivery mechanism,   | 949,697   | The second secon |
| Pyrgineer R J Strokin 939 815   | Lamp J H Purdy   | 909,804  | Propeller ship's, S. Labrysowski<br>Pages, J. Holet  | 蠿   | The state of the state of the said   |
| Progress operating residence of terrors of the Progress operating residence of possible of the Progress of the  | Lamp J H Purdy   Griswold 980 187   Lamp burbet vapor, S Griswold 980 187   Lamp suchar J Lawler   Lamp silect how & Cole   Lamp locking device, incandescent, Timm &   Lamp sacket electric, J G Poterson   | 900, 101<br>900, 211<br>900, 211<br>900, 214<br>900, 214<br>900, 948<br>900, 900<br>900, 900<br>900, 900<br>900, 900<br>900, 900<br>900, 900<br>900, 900<br>900, 900 | Pump tire W S. Stapley<br>Prock, creist setting and embouring P O.   | 100,000   | THE PARTY OF THE P |
| handling innerting unequity of the state of   | Lamp locking derice, incandescent, Timm &  |  | Mieth  | 999.104   | THE RESERVE OF THE RE |
| Freet water heater Sweeting & tribile 1860 5-9<br>Freet attachment J R Graft 1860 184   | Harobardt<br>  Lamp sorket electric, J. G. Potomen   | 900 518  | Panie A II Wheeler   | 100   | Treesing machines, separating grate for  |
| Feedback inserting markets W. O. Who-!  Feedback in the State of A. Indian State of   | Hardardt Lamp socket electric, J. G. Peterson Lamp support adjustable selectric, J. B. Coe   | 960,076<br>968,073<br>969,073<br>969,636<br>969,112<br>969,778<br>969,688  | Nach rail G R. Lynch   |   | Process on the Parket  |
| Process for act of the July Services of Partial Process of Partial Pro  | Lamp switch, incandescent, J. A. Mohame-   | 906,013  | Radiator fort reet B. G Briggs   | 世間  | The submiddle H. H. Shafer   |
| hittering apparatus C M Chamberlain 0 0 461   | Lantern F D Roear  | 900,636  | Ball holder, W H Brown   | <b>建业</b>   | The for vehicles, electio 1, 8, Bellieben, Philip  |
| Pire sterm, antomatic J Yates 979 RDs   | Last, dirided, J D Winehester  | SAD 673  | Hall joints, spiles bar fer, W P & E. G  |   | The protector, paymentic, R. J. Morrison, Sales  |
| Firem T ( Johnson 100 H12   | Leg Joint artificial, D W Price  | 936,778  | Rall third C A Binhm   | 969, 557<br>969, 069<br>969, 150  | Tire, roblete, J. W. Carbart 100   |
| Firepose countriction A Priodic 900,125   | life preserver Wilkinson & Upham   | 900 129  | Rail tie W D Williams  | 940,130   | Tire, velicite wheel, W Wirehard   |
| Firepress door or shutter N H Medical DV6 576   | lifter See the lifter  | 050 650  | Reflect consider I & Smith   | 100.220   | Tim, wheel. H. Datal   |
| Fish book A Payers 1000 187   | Line casting machine D # Kennedy   | 959,659<br>969,775   | Raiway frog J R. Conky   | 悪悪  | Two driving mechanisms. W Joseph . His con-  |
| Finnging machine automatic J F Grayhiii P'9 (to)  | mes handen for Pearse & Billington   | 900 971<br>939 403<br>909 114<br>919,857   | Railway switch, R. P Kilelinger  |   | Tool tetainer for sir silverie, or merhanit.   |
| Flack from heating apparatus 1 Philips 920 016  | I liquid retainer W B Plak   | 器報   | Railway switch automatic E Heward<br>Railway switch mechanism automatic self-  | 900,017   | Boy 7 T Angeld 1   |
| Figure 1 and 1 and 1 and 2 and 2 and 3 and  | Lock washer M D Heaguer  | 919,817  | Rallway system electric P M Case   |   | Toy or picture both, G. Tark   |
| Fined operated apparatos R Ketter r 100 547   | electric V I. Rendenus   | 910 021<br>900 010   | Rallway tie T In Rycreft   | 100 Mg  | Profile mentation white 7 7 williams and out   |
| Fly paper holder, Stoner & Trent 0.0 898  | Laure for weaving pile fabric, L. It Hart  |  | Railway trains, smoke conveying attack-  | 100.117   | Train agains and brake releasing mechan-   |
| Fly frap F M Humphrey 100 717<br>Flying nuchine motor A Wunderlich 100 176  | Leem pattern mechanism J T Cyr   | 960 274  | Railway tramway and other rehicle J R.   | 960,148   | Tennens leader, Gpr & Princeson  |
| lace 900,138  | langs hobbin stripper for waft replenish   | 12 119   | Ranger combined solid fuel and gas C H   | 960,148   | Tres rest. J. W. Walter  |
| Find products apparatus for dehydrating   | Louis this piece detecting mechanism for   | 900 es4  | Batte kitches C II Mines   | 100,104   | Trend, safety, J. V. Stappen   |
| hart goard W R Nawhall 980 035  | Loon wire motion for F A. Whitmore   | 940 311  | Batchet wrench C H. Anderson<br>Barmtaria, Hendi A W Von Bort  |   | Troller pole, C. E. Brestford  |
| Fruit mixing machine B F Fish 126 728   | Mali ber 1. V Rood   | 909,880  | Berord card, D. R. Hunter  | <b>65.69</b>  | Trailey wire suspension means, S. S. Reck-   |
| Annual Markette Pred Greek Annual & Wal    90.134    10   1   1   1    10   1   1   1    10   1   1    10   1   1    10   1   1    10   1   1    10   1   1    10   1   1    10   1   1    10   1   1    10   | James and State State of the Control   | 900,511<br>900,511<br>900,511<br>900,107<br>900,107<br>900,407   | Becording mechanism W L. Morris  | 960, 184<br>950, 170<br>950 607<br>950 607<br>970, 662<br>970, 663<br>970, 667<br>970 650                             | The second secon |
| Full means for feeding field, T Turnbull 040 057  | Mail delivers W M Cortbell   | 959,44N  | Reflector W II O Belene<br>Refrigerating apparetus F D Reschie   | 960,007<br>950 GM   | Truck, tonger, C. A. Fooli 000,210   |
| Fuel Breans for feeding field, T Turnbull Jr 900 007 Furnace J Weints 839 940 Furnifure W A Suyder 959 031  | Nerther care W Potter  | 960,039  | Refrigerating afterbuent for milk cane, R.   | 990 046   | Tibe denning tool, C. P. Overly median   |
| Purniture attachment sliding shee W   | Marking laundry tage, clothes, and other   |  | Refrigerators and ice hoxes, drip cup for A  | 940,103   | Tuffing markins, W H. Huner 1990,078   |
| Dichmann 950 478 Dichmann 950 478 Dirithra collapsible A. M. Holmes 960 015 Dun block J. Collina 960.155  | articles made of tentile fabrics, H.   | 934 960<br>939,790   | Registering machines electric driving de-  | 940,103   | H. Boser Section Support No. W   |
| Purniture collapsible A. R. Holmes 960-015<br>Pine block J. Collins 960,155<br>Fune for electrical election, kintner A. Res   | Measure tape 1. In Joseph Measuring instrument electrical, C. B  | 919,790  | Relay interlocking contact W M McClin-   | 1070,548  | Tup, hume A L. Sacklemire 900,074 Turbles, combustion, R. S. de Perpanti 90,100  |
| ( mblatt 950 552  | Foster   | 950,497  | Balance and the state of the st | PUD 000   | Turbines, turbe pumps, etc manufacture of  |
| Fine block J tollins 900,133 Fune for electrical circulin, Kintner & Ros unblatt Fune mfety Bachs & Reynolds 920,937 Funed i crainal Conway & Hisbing 900 710   | Kintur   | 900 55 L<br>USB,973<br>916,685<br>939 826  | Beneroles assuratus for forcing liquid out   | 000 tot   | of, B. E de Ferranti pro.161   |
| Fuel W It Jackson 900 001<br>Hage J R Viscon 960,190  | Measuring role for fallers, A Temaselli<br>Meat roll sanitary W 1, Allam   | 916,685  | Bevolving furnice for volatilising metals  | DOIN GO!  | Type custing macrime if V pagrardmon property  |
| Fuer for electrical circuits, histor & lines and 200 MeV in the circuits of th  | Mechanical more ment T Willi   | 9:50 RSS   | Billian helt II ii Worer   | 17 11R  | Type setting apparates, J. K Johnson 900,006   |
| Games cage for A. Touckins 839 073  | Metal has and seate () Mark  | 909,454<br>939 551   | Ring and lank convertible G Bear   | 959 K16   | Type writing markine, W J Barron 100 666   |
| Garden Implement, O. H. & W. G. Perples 800 707   | Metal handing punching and trimming an   | 939 483  | River setting machine single bear multiple   | 959 KN6<br>950 677<br>950 788   | Type writing marnine paper finger, (   |
| Carment supporter II C Hine SCO.507   | Metal producing bollow articles of W   | 1 m/m 4472   | Boller drill, II R I frighes 909 530,  | 939 B40   | Type writing markine ribbon freding mechan-  |
| Oas and air mixer for burners, Peterson &<br>Lackett<br>Gas burner for flare lights (   Wakefield 900 127   | Melala from craphs minthesa, precinitation   | 000 518  | Rotary engine P J Spinehnie<br>Rotary engine, G H Hardy  | 020 M15   | Type writing markine ribbut reversing  |
| The state of the s  | of R P Kirkpatrick   | 979 777<br>939,745<br>939 717<br>960 945<br>969,860<br>969,750   | Ruler porting W Morris   | 958 640<br>959 812<br>979 858<br>959 958<br>959 191<br>959 472<br>959 458<br>959 559<br>959 740<br>959 747<br>959 471 | merhanism, automatic, G M Kits-  |
| descent lights incandescent F Krathy 8-9 700  | Merate uniting W Griffifb  | 939 B17  | Saddle C A l'orama   | 910 MI  | Type writing markine tabulating device, P  |
| Can go Berntor accipion, M. W. Carrier STALES   | Milk carriage attachment C E. Sweet  | 900,860  | Hafriy plu Dancy & Westerit  | 172   | Umbrella, A Peck 960.065   |
| Cina lighting apparatos, electric, D M  liariford et al 959 525   | Mixing patchine F Nots<br>Mointruer envelop II M. Packer   | 940,793  | Sandyspering machine P Schlinmei   | 930,414   | Umbrella bolder lock, Wilson & Harman 960,121  |
| Gan lighting system, regulator for U E.   | Moistening marbine for adhesive materials  | 910 R75  | Hash lock A. R. Landis<br>Bush lock R. G. Wellman  | 979 576   | United remove of P Hall 960 160  |
| Gan lighting system, regulator for U E.  Rulas  Gas main stepper P Gostman  Gas mixer C V Pollock  950,007  | Mold R C Bleker  | 910 R75<br>950 R06<br>900 025<br>900 177   | Raw clamp (* A Stovens<br>Scuffold elevation M Hercel  | 960,204   | Vacuum cleaner, Foster & Glidden 200 750   |
| flases etc., separation of, Levy & Hel  | Molding machine Keyhoe & Handley   | 949 177  | Scale, B E Blair   | 950 837   | Valve and the like step J Flatcher 900,729   |
| Gaset etc., separation of, Levy & Hellowers, 1999 503 503 503 503 503 503 503 503 503 503   | Motor controller T R Barnung   | 959 907<br>959 968   | Straper, road II Wicehelman  | 100 000   | Carroll 900.458  |
| Gering framewission W F Swort 130 900<br>Gill box drawing head 11 L. Offermann 198 107  | Motor controlling derice T K. Julium   | 950 90W  | Serent, See window acress,   | Den our   | Yaive, electric, L. M Schmidt 200,000  |
| Ulass articles and vessels producing win<br>J. L. Arbegast 980 166  | Motors on their of and means for bilemeter   | 959,950  | Reres plate facted by means, Webb &  | 979 979   | Valve engine, Anderson & Hanson 900,000<br>Valve, engineer's, W A. Dendry 900 704  |
| Glass, method of and machine for making   | N. A. R. Cobitt  | 980 000  | Screening mechanism, W W William   | 979 970<br>900, 671<br>959 786<br>969, 835<br>959, 911  | Value for charms fromting during angiles.  |
| Glass, included of and machine for making use J W Hoper (Included the Section of H C Pry 905,500 (Inverted the Section of H C Pry 1905,500 (Inverted the Section of H C Pry 1905,500 (Inverted the Section of H C Pry 1905) (Inverted the Inverted the Secti  | atus for electric J A Scharter   | 979,587<br>999 635   | Screw machine G T Warwick  | 900,600   | air, J H. Priodeuwald , 960,084  |
| Gluing marking J P Kapf 939 TT  | Mowers grass catching device for laws  | March (200   | Berrys adjusting means for feed Shampon  | 959 R10   | Valve, retaining P H Words 100 to  |
| G II Hayen Grant Wilson for explosive engines  G II Hayen Grant Wigness   | Howing marking J A Pora  | 910,812  | Repareting bowt device for assembling parts  | 800 KT0   | Valve, triple W A Pendry 200,000, 800,001  |
| Covernor, cagine ( Creat Science Section 1  | Mumor W J Hewitt   | 909,723<br>919,972<br>909,872<br>909,878<br>909,678<br>900,678<br>900,150<br>900,150<br>900,624<br>900,624<br>900,624<br>900,640<br>900,600                          | of a contrifugal R R Balley  Reparating process, electrostatic W C   | 900 900   | Alchele claritic driving mechanism, A  |
| forerone for steam or elastic fluid oughnes.  White Grain heaters, agiltator for, A. J. Kergie 200,224 Grain sheaters, agiltator for, A. J. Kergie 200,224 Grain sheaters, agiltator for, P. J. Kergie 200,224 Grain and dirich line cutter, C. Dawes Grate W. Marrego Grate W. Marrego Grate for concentrator Jign 8 P. Rebinson 800 111 Gravity Jign attachment P. Rebandon 850 007.  | Verille thronder C L. Woulder  | 030,678<br>830,095   | Swart<br>Sewing marking W P Lantonechiness   | 960 646<br>960,046  | Vehicle motor, W. P. Mays 900,071  |
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(Concluded from page 476.) physical oceanography, that is, the physical investigation of the sea, com-prising all kinds of instruments, such as inding devices with samples of the bottom, bottles intended for taking r samples and recording the tem-ture at a given depth, apparatus for nvestigating sea currents and the density of sea water, instruments for studying the penetration of light into the ing the penetration of light into the depth of the cosm, laboratory installa-tions for the physical and chemical analysis of sea water and sediments, a collection of elements contained in sea

collection to sources water, etc.
All these variegated exhibits have been provided with labels in the three principal languages (Freech, English, and German) which greatly add to their utility and enhance their inter

The first story, which is situated at 64 maters above the sea, likewise contains a large hall, in the center of which is bosts with the whole of its equipment, on the walls are arranged air comprehensive collections of photographs relat to the waynes of discovery organised by the Primos, and all hids or discovery the primos and the section of the primos of boats with the whole of its equipment. security of the security of th

sea are on exhibit cither in a fresh con dition or as preserve; and even such ma terials as fish oil, guano meal, etc., are represented

which will have to be further developed comprises all kinds of fishing instru-ments (boats, nots, etc.), either in the ments (boats, nous, etc.), etter in tas natural size or in the shafe of diminu tive models. Many scientists and the Prince himself have designed special mechanical catching outfits for deep-sea fishing, while other instruments had to fishing, while other measurements be constructed for gathering the microscopical plankton of the surface, inter mediary sones and sea bottom, as well as for extehing ocean animals of especially large size. All these manifold utensits are indispensable for obtaining life, and evolution of those mysterious animals, and apart from their scientific interest, are of much practical utility by enabling suitable means of protection to be ascertained in the case of organis

In the same hall is found a represent ative collection of art subjects, imitating the wonderful and most variegated forms of marine organisms. Besides the most modern productions in this connection are represented ancient Greek modeis with pictures of fishes, crabs, and dolph line as well as Japanese engravings, which show an admirable treatment of dates.

The two underground or b stories opening on the sea are admirably lighted, and apart from the squarium stortes opening on the sea are admirably lighted, and apart from the squartum hall, are not accessible to the public being set apart for laboratory and research work. The upper basenest story contains those rooms in which the collections are made ready for exhibition and state, in sidilation to a number of pigtute laboratories, and a special library in cossionarcaphy.

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to chemistry, ocean physics, physiology etc, whereas the four remaining are set apart for scological, botanical, histolog astern end of this story

castern end of this story in the lower basement story is found a workshop destined for different kinds of rough work, especially the mounting of big animals, such as large fishes, whales, scale, etc The numerous apparatus installed therein are operated by a gas motor A special room is reserved for the dressing of fish and whale skele

Two rows of squaria are installed in the eastern wing of this underground story An enormous iron-concrete table 21 40 meters in length, and 087 meter in width, parallel to the first row of aquaris (between the latter and the win dows) is destined to receive a large dows) is destined to receive a large number of transportable aquarium tanks of various sizes, the overflow from which is discharged direct on the table, the lat ter being so inclined that the whole of the water is collected in a central trough These excellently lighted research aquaria will allow of a multitude of aquaria will allow of a mutitude of physical and biological researches in the field of oceanography in the small aquarium basins can be investigated those smaller size animals which, being lost in the large aquaria, have to be conveniently isolated in conditions corre ding to their particular mode of life. sponsing to their particular mode of inter-The sea water, derived from a rocky spot where owing to the continual whiri pool it is always fresh and well aerated, is thrown by two electric pumps to 64 meters height. From the receiving tank the water is supplied over a fall of sev cral meters to the aquaria, allowing these tanks to be automatically acrated The Oceanographic Museum thus is not only an institute intended for the not only an institute intended for the instruction of the general public, but a center of scientific investigation where students of coeanography will always be sure to find an equipment more compe-hensive than anywhere else in the world

The Seine at Paris runs betw stone walls in a channel that is spanned by many bridges. The width of this channel may be seen by noting that the

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of seasons No. 91.84. Wherea, a mail bressels which have up to our time prematurely source of the reguere tech. Some power wise a season of the reguere tech. Some power wise and descripted half our race statement of the reguere tech. MADUIDA. I seniry No. 9186.—Wanted the marce and add of a skunk relater form

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Inquiry No. \$163.-Wasted, addresses of shirt nakery in Manbettan, who will make a tew shirts of county design. pertal design. Inquiry No. 9163.—Wented, magazineturers of a reads worked by clock work. Inquiry No. 9164. Wanted manufacturers of a vacuum pump that will arhand from \$5 to 400 c b looke of air per strate and built as light as preside. Inquiry No. 9165. Wanted, rames and addresses of parties having deputts of ownered siles and, or

Post Alexandre Trois is but \$52 desir-long. The constriction of the food waste within this relatively narrow channel was one the banks of the Scine.

DB. ROBERT ECCE.
(Concluded from page \$65.)
trypanosomes which are the specific
cause of the steeping sickness, and there
Koch elaborated most important prophylactic and curative measures

this most melancholy disease.

This faithful servant of his race never rested. Coming from Africa, he too rested. Coming from Africa, he took part in the International Congress at Washington, observing then "I wish to devote myself for several years to come, to further investigations of these problems"—and this in his sixty-fith year.

Thus Koch's sojourn among us means this Formerly men folded their hands supposly in the presence of horrible in-

aupinely in the presence of norrible in-fections, now we know that by means extraordinarily simple and practical (how amazingly simple, after they have been evolved, are the conclusions of genius), by the rational use of our faculties, and by realising that we ourselves are coefficients in the working out of our own destinies, it is indeed within our power to be rid of those infe

THE COLLECTION OF BUTTERFLIES.

Jeaning Total Bild. Where the same and address.

In the Confirmed from pope 64 is leading to the control of the onous, and even the fumes, if inhaled onous, and even the futures, it immares
will prove dangarqua. Although this
method may yield good results to some
collectors, I have always used a simpler and more effective way. A bottle with a medicine dropper as a cork is filled with benzine or gasoline (8) with besuine or gaseline (8) The in-sect is secured in the same manner as previously explained, and a generous dose of bensine is administered, which kills instantly The bensine will spread over the whole specimen, but soon evuporates and leaves the insect none the worse for the bath When the insect is dead, it is placed in a paper envelope made in the manner shown in 10

manner shown in 10

Some of the large moths have greasy
bodies, and will, therefore, have to be
degressed This may be done by placing the envelopes containing the ins gasoline for twenty four hours or more

Spreading the Insects -- If on reaching home there is time to spread the inserts caught during the day they should be taken out of the papers and treated in the following was For use in spreading, a perfectly flat board with an abso lutely smooth surface, some insect pins some pieces of plate glass of different sizes, and a few needles stuck into match sticks are needed. The insect is taken between the thumb and the index finger. and an insect pin is pushed through the thorax, as demonstrated in 11 With a broad-tipped tweesers, which may be purchased at any instrument maker's for a small sum the wings are taken hold of small sum the wings are taken hold of where they join the body, and are gently bent open until they remain in a horison-tal position. Then the insect is placed upon the board and the pin is pushed in. upon the board and the pin is pushed in. Now a pin is inserted behind the heavy vein, and the wing is gently drawn for-ward until its base is perpendicular to the body. The pin is pushed into the wood. This operation is repeated with wood This operation is repeated with the other wings, and stripe of gines are placed on them to press them flat. The pin which was first thrust through the thorax is now gastly extracted While thours is now gastly extracted. While the pin is being withdrawn, the pieces of glass should be held with the thumb and the first fanger of one hand. The in-scels are helf on this hourd for a weak to two, and may then be removed for mounting (13). If the inscein have (Generalized on page 421.)

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(Opnoteded from page 400.) et for any length of time in the Been set for any leagts of time in the triangular papers, they must first be re-leased or softened. This may be done by placing then over night between moist cloths in a box, adding a few drops of carboilo acid to prevent mildew. They should then be spread in the manner

evicusly explained.

Mounting.—The last step in the pr on of the insects is the mounting There are various ways in which this may be done, but the writer knows of may be done, but the writer knows or none better than that invented by Denton Brothers of Wellesley, Mass. Cases of glass are made, varying in size with the gisse are made, varying in size with the size of the insact to be inclosed. These cases permit of a clear view of both the upper and under side of the specimes, and the size of the size of the size of the many that the size of the size of the placed in position, the top which is larged at least of the size of the hinged at one degs is closed over it and is sealed with the passe-partout binding. which forms the sides of the box Bo simple is this method of mounting, that The mounts can be obtained at prices even a child can obtain very fine results.

The mounts can be obtained at prices ranging from five cents up. There is an other mount with which good results can be obtained—the Riker insect mount. se mounts consist of a nest cardboard box having a glass top cover and fille with fine cotton batting, in which the in sect is readily embedded The glass cover when closed holds the insect in place The only objection to these mounts in that both sides of the insect are not visit ble, and therefore two specimens will have to be mounted to show both the upper and under sides. Riker mounts may be obtained from all instrument makers

having a natural history department Collection of Sperimens -- Now that the sethod of mounting and preserving the insects is known, the next thing i e next thing to be insects is known, the next thing to be a second of the control of Never run the collector must stalk them after a butterfly You probably will not catch it and moreover may scare others resting near As soon as the butterfly alights upon a flower, approach it care with a rapid awasp of the net capture it.
The moths are harder to find because they fly at night. The method most often resorted to by collectors is known as augaring A mixture of brown augar, stale beer and molasses is made, and at dusk is painted upon the trees. In a few hours, if the locality is productive the moths will be hovering about the trees half the night.

Naming and Classifying -When the insects are mounted they will have to be named and classified Butterfiles and moths belong to the order called Lepi dopters Few people know the difference between butterfies and moths There are several great differences In the first place, all butterfiles have club-shaped an tenns or feelers, that is, the feelers ter minate in a club All members of the order Lepidopters which have not clubshaped antenne are moths. In the sec-ond place, all butterfies are diurnal that is, they fly by day, while most of the moths are nocturnal or fly by night Sev eral minor differences may be noted, the first of which is, that butterflies generally hold their wings erect when at rest. Secondly, butterflies transform from the caterpillar stage to the winged stage in a naked chrysalis, and moths have a covering, no matter how primi-

tive, which is called a cocoon.

Reference Work.—In all entomological work standard books are necessary in order to identify the specimens. Dr Hol land's Eutterfly book and his Moth are standard American works, and in them may be found colored plates comprising pictures of most of the butterflier and oths of North America, north of Mexi-







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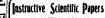
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BERTILLON AND THE BURGLAR'S JIMMY.

(Concluded from page إدني) two dynamometers of unequal power The stronger dynamometer having a maxi mum (apacity of one ton and for the measurement of vertical efforts is connected to the top of the frame by a screw, by means of which it can be raised or lowered a few inches. The low er spring of the dynamometer is attached to a heavy vertical steel plate, which slides in grooves along the two vertical posts.
When the index of the dynamometer is when the index of the dynamometer is at the zero point, the bottom of this plate which is about 1½ inches thick, is about % inch above the slitting horizon tal plate. In this interval is inserted a wooden board % inch thick, with its edge flush with the bottom of the vertical steel plate. The experiment is made by inserting between the board and the Ver tical steel plate the end of a 'limmy' or other burgiar's tool and endeavoring by moving the handle of the tool up and down, to produce on the board impres-sions similar to those which have been found on doors and furniture The index of the dynamometer moves in accordance with the effort exerted and by means of second index which remains fixed when the first returns to the zero mark the instrument automatically registers the

The figure thus obtained indicates only the vertical effort or effort of pres but there is always a horizontal compon ent of greater or less magnitude and this is registered by a horizontal or traction dynamometer, which is attached to the sliding horizontal steel plate

sliding horizontal steel plate
Either of the dynamometers can be
used alone or both can be employed
simultaneously in this way it is possi
ble to measure the horizontal and the vertical efforts separately or in combina tion In the latter case M Bertilion has found that, as might be expected the horizontal effort is always much smaller than the vertical or pressure effort example, using a lever 20 inches long a vertical pressure of 1 300 pounds was ob-tained simultaneously with a horizontal traction of 330 pounds A strong man, operating on a hard walnut plank can

develop a pressure effort of 1 500 pounds.
The apparatus can also be turned over on its side so as to place the experimen tal board in a vertical position purpose of investigating the forcing open of a door. In this case a second piece of would is introduced to represent the jamb of the door. The same arrange ment in the normal position of the apparatus. is used for investigating the opening of a

drawer or a cylinder or other desk etc The idea of employing a dynamometer in the study of burgiary appears so sim ple, that it is surprising that it was no ne long ago Henceforth judicial quiries will be guided by the results of a series of experiments which will furnish points of reference. From measurements made with the Bertillon dynamometer it is possible to discover whether the burglarious entrance was effected by a man in a child or several persons

Finally the study of the impressions made by tools has kel M Bertillon to give these impressions distinct names accord these impressions distinct names according to the part of the tool by which they are produced. The word 'foulce is reserved for the impression made by the polut of the tool "écornure" for the notch made by the body of the tool in pressing on the edge of a door or piece of ture, and the word "nesse for the indentation produced by the clow of a 'jimmy or similar tool on a plane sur-face. For the identification of the tool the most valuable evidence is furnished

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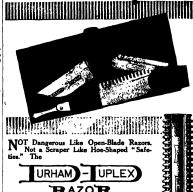
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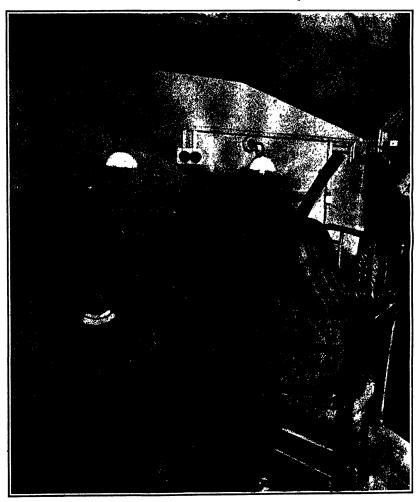






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### Scientific American

### SCIENTIFIC AMERICAN ESTABLISHED 1849

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NEW YORK, SATURDAY, JUNE 18th, 1910 The Editor is always plan to receive for enamination illustrated articles on subjects of timely interest. If the photographs are shorty, the articles short and the facts authority the contributions will receive special attention. Accepted articles will be paid for at regular space rates

A STREE ARCH SUGGRETED FOR THE QUEBEC BRIDGE T the time when the plans for the 3,100-foot Hudson River bridge were under discussion and it was generally accepted that itself to the then unprecedented span of 3,100 feet was either the cantilever or the suspension bridge there appeared a remarkable paper by the well known bridge engineer Max am Ende, in which a design was presented for a steel arch bridge of 3,000 design was presented for a steel arch bridge of 3,000 foot span, which was to be overeigh on the castlever principle. the load, during evention, being carpringly, the load, during evention, being carpringly, the being carpringly of the castlever of the proposition is made by Charles Worthington, for the construction of an 1,800-foot steel arch at the castlever of the construction of an 1,800-foot steel arch at the construction of the bridge construction of the constructio Quebec Bridge crossing. The elevation of the bridge shows the characteristic beauty of the stell am 31r Worthington in cowinced as the result, study of the problem, that not only would ask of this magnitude be practicable, but that in ga-cent it would compare favorably with a bridge on the cuntilever on the supersion princip wide, of course that suitable abottomate could get vided to take the enormous horizontal components
the thrust. This it is proposed to do by consider
a huge concrete strut, or compression member: a nuse concrue strut, or compression members and ground, extending from the base of the piera, the rock of the river bluffs. Each strut is 20 feet and 98 feet in width, and should therefore a sufficient for the surface of the structure.

sufficient for its purpose
Certainly, the most difficult problem is that if the thon, and Mr Worthington proposes to solve the original method of building an erection shown sion bridge cuttiently across the site, and small not be individual voussoirs, of which the main not is mposed, from the cables, the lower ends of the ter being provided with adjustment devices by letter latter being provided with adjustment devices by which the vouselvs can be held in proper position during erection. The abutting faces of the vouselvs mount to accurately machined and provided with fianges by which each section after it was lowered into position would be secured to the erected portion of the arch. The arch consists of four parallel risk of hollow retamniar section, each 31 feet deep at the crown, 45 feet deep at the twenty and the wide. When the keystem of the crown had been low ered into place and riveted up, the suspended cable would be slacked up and removed, and the whole sus pension bridge taken down leaving the four great ribs of the arch ready for the erection of the suprios of the area ready for the erection of the sup-porting columns and the superstructure of the floor The element of doubt which enters into this design is due to the system of erection adopted. It is quetionable whether, with the flexible support affords the suspension cable it would be possible to hold the voussoirs with that absolute accuracy and rigidity which is necessary it is well understood that dur-ing erection voussoirs must be kept in exact position by absolutely rigid falsework. Max am Endo was to secure this rigidity by designing a framebridge, and tying back the successive sections, as they were added, to rigid anchorages on either shore Fur thermore because of the great weight of the bridge. whose dead load over the whole 1,800-foot span is estimated at 26,000 tons the erection suspension bridge would have to be extremely heavy and costly it is but fair, however to quote Mr Worthington as stating that the estimates of the total cost of the structure in dicate that it compares very favorably with the cost of a cantilever structure, even if the clabs rate erection plant be considered to have no subse-quent salvage value

### STE THOMSAWD WILES IN AN ARROPLAND.

T is doubtful if any one, among the many thou-nands who have witnessed Hamilton's speciacu-lar flights at Mincola, Long Island, and wondered at the bird like facility with which he performed

his evolutions, realised that his success was the out-come of some six thousand miles of actual flying which he had done during the past six months

In qualifying for the degree of "bird man," Hamil ton has served a long apprenticeship and has travd the whole gamut of aeronautical experience. light but athletic build, quick but cool, and richly endowed with that intelligent daring which is accessential to success in aviation, he has probably had more varied experience in the air than any other ving man He has been carried up by kites, has inving man is on a been carried up by steep, has not hesitated to cut loose in gliders at disay altitudes, and sweep through perilous distances to earth, and with balloons both apherical and dirigible he is altogether familiar With so much secumulated experience of the "feel of the air" at command, and with his rich endowment of the natural qualities of an avi his seat in an aeropiane, he should quickly become of the most, if not the most, experienced and s cessful exponents of the new art of human flight Starting last November with a Curtiss machine, he has spent the intervening months in touring the coun try and teaching the public to what a pitch of per fection human flight has been carried Four days a week, for the past six or seven months, he has give exhibitions throughout the country, largely in the West and Southwest, making on each occasion four or five different flights Hamilton estimates that the total distance that he has flown through the pathle air in the intervening period is approximately six thousand miles, or sufficient to have carried him from New York to San Francisco and back Just here we should remark that it is fitting that a Hamilton should leave his impress so strongly on the pages of aeronautical history in the United States, since he is a direct descendant from John H Hamilton the brother of Alexander Hamilton, John H being the great great grandfather of the present Charles K. Hamilton During a recent conversation, and at the request of

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in recover. Arrans, for instance, the government gages showed that on the afternoon of my exhibition, the wind was blowing thirty three miles an bour My 8-cylinder, 50 horse-power Curtiss machine was brought out, and held in position facing the wind As the propeller revolutions increased, the thrust reached a point at which the machine began to lift and on letting go, the crowd were astonished to se me apparently flying backward. As the motor ga velocity, I first became stationary over the starting point, and then, with full power developed, traveled over the ground at a speed, relatively to the ground over the ground at a speed, relatively to the ground, of ten to fifteen miles an hour. On another occa ston, at St. Joseph, Missouri, Hamilton rose and gave successful exhibitions in a wind which the local government anemometers registered at thirty nine miles an hour. The roung aviator considers that the bugs hoo of the wind has been eliminated, and that from now on the skilled "bird man" will no longer wair and for three-fourths of a windy day in the hope of making a flight in the remaining fourth. It is not the velocity of the wind, but the sudden changes in the velocity, that constitute the peril. In a twenty-five-mile wind, the velocity will sud In a great change, in the pulls, from fifteen to twenty-five miles, a difference of ten miles per hour, and the range of difference increases with the increased speed of the

ATTOMATIC CONTROL -- Asked for his oninion of the value of automatic control, such as might be i by pendulum action or by the gyroscope, Hamilton surprised us by affirming that he did not believe in such control "The pendulum effect would tend to such control "The pendulum effect would true to become rhythmical, and the swing might be in the wrong direction at the critical time; on the other hand, the resistance of the gyroscopic would be too rigid, and in sudden guest it night be such as to cause the breaking of the planes by transverse bending strains." Where Juries is a great which, the neish on operating Speeds pixit, be not said register for extending one multy, and the Josephan brought less it not in a register for the position of the Josephan brought less it will commit a greatest add search? much as a stilled pixil mit committee a sprinted add search to hole. "The size sipulations recommittee for right in a savojulan are too complicated and hence-related to be complete of above the complete of the compl and lifts it, there are know surfaces involves account to restore equilibrium. First the wing tips or alle-rons must be set to counteract the lifting force; than the front horizontal rudder must be sharply depressed in throw the machina down and gain velocity; and the front normonial redder must be sharply depressed to throw the machine down and gain velocity; and thirdly, the rear vertical rudder must be swing over. These movements must be done with judgment and a delicate touch, and it is difficult for me to understand how the sensitive hand and intelligent mind of the are the sensitive annu and interingent mind or the seronaut could be replaced by purely automatic appli-ances in a complicated evolution of this kind. Fur-thermore, for perfect control, there must be a certain ount of anticipation of what is going to happen erience teaches the aviator to recognize different emounts or anisospation or what is going to happen. Experience teaches the aviator to recognize different atmospheric conditions, he adjusts himself to these and in his manipulation of the control, anticipates the vagaries of the wind These are conditions which a purely automatic control could never meet."

Topic of the

WING SURPACE AND SPEED,-Hamilton looks for considerable increase in the speed of seroplanes in the near future, and believes that some of the more pow erful machines now being built will have made seve miles an hour before the close of the present year. As to the far future, the high-speed racing machine will probably be a monoplane, with long, narrow wings, processor on a monoplane, with long, narrow wings, affording small supporting surface relatively to the horse-power. One of the most interesting facts de-veloped during the varied experience of the past six months was the accidental verification of the impormonths was too acciousnia verincation or the impor-tant principle enunciated by Prof Langley, that the bigher the speed of an aeroplane the less is the necessary sustaining surface. It happened that in adjust-ing the engine at the commencement of an afternoon exhibition, the intake valves and carbureter caught fire, and several panels of the central covering of the upper and lower planes were burnt out, leaving only 150 out of 250 square feet of surface intact. Rather than disappoint the assembled crowd of 8,000 people, Hamilton determined to try for a flight. Ordinarily, a 100 to 150-foot run would have been sufficient, but in this case it was not until the machine had run over 1,000 feet, and the engine was working at its maximum r, that the machine lifted Imp ton discovered that he was flying much faster than he had ever done before, which, of course, was stri-in accordance with the above-mentioned law

Here is a hint that the racing machine of the future will have some system for reefing, which will allow the sustaining surface to be reduced, and skin friction eliminated as the speed increase: Conversely flying at El Paso, in the rarefled air due to an ele tion of 3.980 feet. Hamilton found at first that he could tion of 3,800 etc., Hamilton found at met chain tee of mot set off the ground at all. The sustaining planes were lengthened, and 135 square feet were added to. the normal area of 250 square feet, with this increase, the machine rose, and successful flights were accomplished. As the result of this experience, Hamilton believes that records of high fring in which, the ma chine reaches the rarefled strata of air, should be cepted with considerable eaution

Not very long ago, timber was selected entirely according to its external appearance. The diameter and length of the piece, the straightness of grain, sometimes the weight, sufficed to determine both its nmercial value and its destination. At that time, on account of the difficulty of transportation, woods of local origin were almost exclusively employed. It is very different nowadays. With the increase in consumption and the decrease in the local production or any varieties and the decrease in the local production of consumption and the decrease in the local production of the the exact determination of the structure of wool. The compound microscope is now used for the minute and careful examination of longitudinal and transverses sections of a specimeno of timber, the compared para and the proper industrial supplement of which it is desired to determine. Prheyrian and timble-saled cells sustry the solidity and resistancy which are brea-tering the solidity and resistancy which are brea-tering the solidity and resistancy which are breat-ced to the solidity and resistancy which are neces-patible with the solidity and resistancy of paraging and the silled with density of the solidity and the solidity and the silled with density of the solidity of the solidity of the silled with density of the solidity of the solidity of the silled with density of the solidity of the solidity of the silled with density of the solidity of the solidity of the silled with density of the solidity of the so

CONTINUED TO SERVICE AND ADMINISTRATION OF THE PROPERTY OF THE

Signing with draw the nary officers) in case of war. Balletting is one recent article on the six Malletting in comportant for the Delaware & Hudon Rail-frieigh, one-potant for the Delaware & Hudon Rail-frieigh, if it et all placets in note that the four frame of the empire. Six one weighting about \$4.000 pounds, are still it visualizes easet steal, having a tendle irvength of 99,978 pounds per square inch and an elastic limit of 99,978 pounds per square inch and an elastic limit of 99,978 pounds of 45,984 pounds, as determined by times made while the frames were at the foundry.

A disputch from Berlin states that the "Von der A dispatch from Berlin states that the "You der Tann," the first of the German direstancept cruisers, needed, on her grollminary trials, a speed of \$1 knots, right, if true, places her, in respect of speed, abreas of the Berlitch "lawfindibles." The latest accounts credit like "with earrying eight, 11-not agan disposed in four theretay, one forward, one at, and two on orleion amid-ships. The displacements is short 15,000 tens.

Figures just compiled by the Pennsylvania Rail-tons system show that although in 1906 and 1909 in various lines carried a total of 399,769,865 passenger on its 34,000 miles of track, only one passenger was the change of a passenger losing his life in an acci-dent on the Pennsylvania Railroad system was one out of about 30,000,000

The navel beard which conducted the tests of the ship brake recently fitted to the battlenhy "Indians," reports that, though it will son, so a vessel in a short distance, it is unsuitable for naval uses. It con-sistent that unless the brake were constantly supplyed it would become slogged with harmanies. It would also interesse the danger from torpodo sitzed, would be also interesse the danger from torpodo sitzed, would be sensewhat related the speed of a ship

Secretary of the Mavy Moyer announces that he has speroved the plans of the two new battleships which have been voted by the Senate and House. Each will nave need by the senate and House. Each will be of 37,000 tone displacement and will oarry an arma-ment of ten of the new and extremely powerful 14-inch guas. In general appearance, in armor plan, and in disposition of the guns the new ships will resemble the "Brorida," which was recently launched at the

A comparison of the strength of the navies of the a comparation of the strength of the navies of the world in deradnoughts shows that Great Britain has seventeen of \$55,700 tons displacement, Germany thir-teen of \$75,000 tons, the United States ten of \$23,600 tons, Sapan sire of 15,510 tons, Russia fore of \$5,000 tons, and Italy four of \$0,000 tons. France has none of the strictly dreadnogght type, either built or build ing. The above figures include both ships completed and those under construction

Hollow steel masts are not the only kind that carry away. The English racing yacht "Brynhild" recently lost her solid wooden must which, in falling, seems to have driven through the light shell of the yacht, caus ing her to fill and sink in fifteen minutes The "Byrn hild" was racing against the seventy-footers "Sham rock" and "White Heather." Usually the failling must entirely clears the hull, as happened in the case of both "Oojumbia" and "Shamrock" I and III during their religious to the contractive of t respective "America" our racing see

The beard of engineers appointed by the Roard of Estimate of this city to pass on the plan to distribute the new Catalili water supply in the various boroughs by means of a deep tuppel, one hundred feet or more below the surface, has reported that the tunnel would neter the surrace, mas reported that the tunnel would cost buffy \$24,000,000, as against \$47,000,000, which would be the cost of building a system of pipe lines. The construction is recommisseded on the grounds both of secondment Syst cost and schall future toot of main-

intance

"The bird decembenship which are listing built for the bird decembenship which are listing built for the bird decembenship which are listing built for the birds are property and the listing and the listing are listing to the listing are listing to the listing are listing to the december of the listing are listened as the control of the listing are listened as the control list. All the listing are listened to the listing and the listing are listened to the listing are listened to the listing are listened to the listened and listened to the listened are listened to the listened and listened to the listened to th

### **AERONAUTICS**

Cept. Beldwin and Joseph Seymour both gave ex-silent demonstrations on the 4th instant of their pro-Sciency in fiying their machines. The latter's biplans is a standard 25-horne-power Curties, while Capt. Bald win has a Curties machine with a tail like the Parwin has a Curtiss machine with a tail like the Far-man and with a chain-driven propellar placed back of the planes and connected to the 26-horse-power mo-tor. The propeller used is somewhat larger in diam etse and of higher pitch than that ordinarily em

Freques de Lessage crossed the Channel on the Sist day of May by way of Calais to Dover with a Birch of the Change Started from the same devo-trace. Count de Lessages started from the same devo-trace. Count de Lessages started from the same devo-ser and the Changes started from the same devo-ser and the Changes started from the Sister of a Barraques, near Calais, from which Birch assented on his memorable flight. The Oout ascended to unitaries to four o'clock in the presence of \$300 apec-tators. His motor was a Guoun, revolving-quinder on gine of 50 horse-power At a height of 1,600 feet he was lest in a heavy fog The torpedo beat "Escopetta," which performed a similar service for Blériot and wanca performent is similar service for literot and Latham, accompanied him, but found it impossible to keep up De Lesseps was unable to adhere to his course, pertly perhaps because of the for, and as the "Escopetta" entered Dover, no one knew any thing at all of De Lessepa. He had landed about two miles to the north of Dover, near St. Margarut, and glided down a distance of about two miles after shut ting off his motor. He alighted at twenty two minutes after four, after a journey of forty-two minutes.

After Count de Lesseps's flight across the English Channel with the Biériot monoplane on May žist (which was the second time this trip had been made by any acroplane), the Hon Charles Stewart Rolls, who was the first Englishman to fly with a Wright

by any serophase), the Hon Charles Stewart Rolls, who was the first Englishman to fly with a Wright who was the first Englishman to fly with a Wright Crossing From Bagiand to France and return. The crossing From Bagiand to France and return The State Was made near Dover at 6.0 P M., and Mr. Rolls covered the 31 miles to Sangatte near Casis in 35 minutes. After circling vitice above the cliffs he returned to England, and landed some distance from the coast. After circling vitice above the cliffs he returned to England, and landed some distance from the coast. After circling vitice her covered some 65 miles made and the state of the England Company of the Engl present with his started to Mr. atarded to Mr. distance from the whorst board of the properties of

Feguant and Capt Marconnet on a Henry Fart plane Starting from Chalons at 4 40 A M the offi cers flew 176 kilometers (1984 miles) cross country to the artillery park at Vinces s, which was reach at 7 10 This flight of two and one-half hours' dura-tion was accomplished at a gpeed of 43% utiles per hour. Capt. Marconnet was able to take photographs and make sketches that would have been of great c interest in time of war. This is the fire practical demonstration of the aeropiane for scouting purposes, in addition to its being a new world's rec ord for cross-country flying with two men in the ma Another French aviator, Labouchère, flew for ten minutes with two passengers at Mours

Previous to attempting a long-distance flight from New York to Philadelphia and back, Mr Hamilton gave some beautiful exhibitions of his skill in flying at Mineola the first week in June He would rise to a height of from \$00 to \$00 feet and circle about, at a sequent or from sou to 300 feet and circle about, at the same time swooping down to within 15 or 20 feet of the ground and suddenly rising again. When he was about to slight he would shut off the motor at a good height, and dive almost perpendicularly to the earth. When only 10 or 13 feet from the ground he would level up his machine, and make an extended gilds only a few feet above the surface. He appeared for ride in the hiphane as eastly and with the same skill that a harback rider rides his horse, and he assemed to take as much subjournent from his dives and oblase pranks as did the large number of interested opener pranama as one the targe number of interested projectors. The machine be has used since last win for in the identical racer used by Mr. Curties at lightness. It is very fast, and has also demonstrated the delicity occurry two possible, since for Hamilton took with a fine of the contract of the contract of the contract and the contract of the

### SCIENCE.

Prof. Dr. Margasell, of Strasburg, president of the International Commission on Scientific Aeronautics will accompany Count Zeppelin on his expedition to Spitzbergen this summer, and will carry out a series erological observations in that vicinity. For this on it is proposed to hold the "international week" of kite and balloon observations, in which meteoro-logical institutions in all parts of the world partici pats, from the 8th to the 13th of August, this year, natesd of during November, as previously inter

Bernard Brunhes, director of the observatory of Puy-de Dôme, and professor of physics in the faculty of sciences at Clermont-Ferrand, is dead at the age of 42 He was the author of many memoirs on phy-sical and meto-cological subjects, and of late had been prominent as the champion of the new methods of weather forecasting introduced by G Guilbert of Carn weather forecasting introduced by G Guilbert of Casm Frunkas endeavored to explain on theoretical grounds the methods deduced empirically by Guilbert, but the extensive polemics on this subject in the scientific journals have not led to any conclusive results

A fund has been established by Mrs E H Harri A fina has been established by MIR DI I ITELLIMAN for the collection of complete data on mammals and other animals of the North American continent Dr C Hart Merriam chief of the biological survey of the Department of Agriculture, will resign from the ernment service to take charge of the work. The Mr Harriman was intensely interested in natu It was with his financial support that Dr Mer riam visited Alaska a few years ago and collected data which added much to our geological and biologi cal knowledge of that region

Attempts are being made to produce textile imitations, equal or superior to natural furs in color, gloss, and adaptability to the ever-changing dictates of fashion, and very much cheaper The substitution would have the further advantage of releasing the natural skins, especially goat skin, for use as leather Mohair and other long-staple wools are most suitable for this purpose A recent issue of the Faerber Zei s a detailed description of the promaking imitation furs, including the operations of

toring, dyeing with acid dyes, precipitating manga-dioxide on the fibers, steeping in aikali, and aforming the bisire shade produced by the ma

dorming the bitter stade produces by the second diodide into green, blue or saryals haven has long been well known that the rural possible is superior to the population of the cities, and population of the agricultural easiers provinces of transp. is superior to that of the manufacturing seen provinces in regard to fitness for military fee. The forty-one large cities which contain out of the entire population of Germany, furnish only green the control of the control Pomerania 123 per cent, Saxony 134 per cent average height of the recruits from the north of G many exceeds that of the recruits from the south The average height for the whole empire is 60 inches the average for Mecklenburg, Schleswig Holstein, and Oldenburg is 66½ inches, and the average for Saxony and Silesia is only 6514 inches

Carborandum, which consists casentially of silicon carbide is produced in the electric furnace from a mixture of sand, coke, sawdust and common sait. V the exception of the diamond, carborundum is the hardest of all known substances, scratching even corundum, which is the hardest of natural stones except the diamond The commercial production of carborundum was first accomplished by Acheson, and the Carborundum Company which he founded pro-duces in its works at Niagara Falis large quantities of carborundum, which is in great demand as a polishing and grinding material. The carborundum hitherto produced contains a trace of uncombined carbon and consequently has a dark brown or black color, which makes it unsuitable for decorative purposes Recently idum Compa has devised a method of producing coloriess and trans parent crystais of carborundum, the refractive of which is said to be even greater than that of the diamond These crystals are produced by charging the furnace with a mixture of 30 parts of pure carbon, The turnisce with a instruct of sawdust, and 4 parts of sawdust, and 4 parts of sait. All trace of color is removed from the crystals by the addition of a small quantity of a metallic oxide, such as oxide of chromium As the refractive power of the diamond is one of its most valuable properties, and the carborundum crystals possess this property in a still higher degree, these new gems may become serious rivals of the diamond, if they can be produced in suitable shapes and sizes, and can be cut and pol-ished like diamonds.

## TELEPHONIC STETHOSCOPE

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN



Telephone relay with caring removed

Great is terest has been center d among British tele honic and medical circles in the interesting device phonic and medical circles in the interesting device invented by Mr S G Brown which was recently de writed before the institution of Electrical Engineers
The vital feature of this invention is the siccessful The vital feature of this invention is the accessful perfection of a telephone relay. For many years in ventors have been trying to develop such a relay but have been harded by difficulties which many engineers have declared to be unsurmountable. As the outcome of aty years patient study and experiment however Mr. Brown has achieved success as test over the truth telephone lines of Great Britain have striking the contraction of 
This risy will his shown in the accompas-ill stration and the design of which may be gain from a reference to the explanatory diagram is



Fig 2 -- The reed and contact Fig. 8 -- kiectrical on

veloped upon entirely new lines and is based upon the researches of Prof J J Thomson Earhart Kins ley and others concerning the flow of electrons across proscopic air ga; between two conducting surfaces at different potentials. Earhart found that when the metallic circuit is broken by a minute opening of the order of 0 000 000 5 centimeter and the metal at tao creer of volvo outs centimeter and the metal at the point of interruptin is platinum the current will flow round the circuit and across the opening and when this interrupting space which he Brown terms the conduction space is slightly altered in length the resistance is varied and the value of the current flowing round the circuit is greatly affected. This constitutes the fundamental basic of the Forence in constitutes the fundamental basis of Mr. Brown a in waition for he points out that this conduction agace is just what is wanted for the current carrying device of a telephone relay where undercoppic mechanical movements have to be converted into large current changes. But the dimensions of this conducting space are so minute that it is a difficult matter to insure and maintain it by mechanical means. Therefore he deviced a method whereby the current flowing secreta the conducting space device tia own advantages occus the conducting space offects the own advantages. are devised a method whereby the current nowing across the conducting space effect its own adjustment in very much the same manner as the current that passes through an lectric are lamp strikes and main tains the length of the are In the disgram Fig 1 there is a permanent mag

In the disgram Fig 1 there is a permanent map on X which is continued by soft true poies right up to but not touching the invar select of cell windags H and X are we would round these soft irres pole obtained as and its release before current to be magnified errollate round the winding H and conceptually by upgring the magnetism set the reed P in wheatigh. Shere are top and bottom metal contact places M and C owhich are opened to an infe-

itesimal degree by the fine adjusting screw W, and by the action of the local current passing through the contact and around the winding E it is the action of the local current operating through this winding which forms and subsequently maintains the conduc

which increase here experienced particularly per fact that the intrument may be torsed upside down and yet produce scarcely gar appreciable later atton in the value of the local curvent and certainly of the value of the local curvent and certainly of the value of the local curvent and certainly of the value of the solid curvent and certainly of the value of the solid curvent and certainly of the value of the said of the value of value drop of thin oil

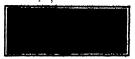
the reed. Both are polithed and work unear a summing of the property of the form of the relay are shown in Fig. 3. The telephone currents to be insteaded enter by the terminals A and circulate through the winding A' the telephone resistance requisiting winding a St. the telephone receiver of approximately 46 chain resistance and at Da an ampere meter or current indicator. The relation requires the property of t

ed oable speaking on this relay is w possible to

delived then it innections and in the control of th

can be transmitted more distinctly and clearly than if the convention were taking place in a room owing probably to the complete absence of schose. The introduction of the local requisiting winding if converte the metal contacts if and O into microphones of axtrems delinery securing a far finer degree of sen sittemess than could be obtained by light pressure thereone our bone. In view of this lack life Brown on between carbons. In view of this fact Mr Brown con tihued his investigations and succeeded in evolving an electrical stethoscope whereby the sound of heart





Combined stothescope and telephone relay.



Ricctric stothescope with transmitter removed.

ests and other internal organs is very greatly magni

This stethoscope is highly ingenious and its design is shown diagrammatically in Fig 4 while the photo-graphic illustration conveys an idea of its general graphic illustration conveys an idea of its general appearance The transmitter if such it may be termed represented by A comprises a shallow brass cell faced with a thin disphragm of shoults. This is placed upon the body in the region of the heart or other organ to be examined as with the ordinary instrument, and to be examined as with the ordinary instrument, and the sound of the best or movement is conveyed to the shoults disphragm then to the air within the tube B to which the transmitter is connected setting the metal disphragm D in vibration The contact pieces M and O are fashioned of cominm tridium M being unted on the disphragm D and 0 on the s

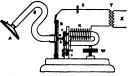


Fig 4-Diagrammatic view of the steth

The reed, together with the magnet N R is st 2º The reed, together with the magnet N H is supported on a brass frame H pivoted or hingad at its lower support F The conduction space is produced between the contacts M and O by the fine adjusting serve W and by the automatic action of the local current flowing from the cell C through the winding from the magnet A special telephone trans-former of equal windings of about 30 other resistance is represented by I in the primary and in the second-

is represented by a many primer and the plan count of the beart beat in internation does these times: Sick as such as a part beat and the plan of the period purposes and the period per

### NEW SYSTEM OF COLOR PHOTOGRAPHY

ve plaie within the last three years, upon . . . yagan a composes over power is mass at one opera-tion direct for the camera, quits an importus has been given to improvements in this line, which will over-come set of the drawbacks of the French process that is, the difficulty of securing duplicate color pho-tographs except by meccasive expectives in the

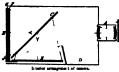
The new system we are about to describe has this particular fusions, that duplicate color pictures can be obtained and Mbless from the first negative obtained in the camera. It has been perfected and simplified in the camera. It has been perfected and simplified th the camers. It has been perfected and simplified by Mr Frederick H Ives of this city and is quite waigue in the way certain apparent difficulties are

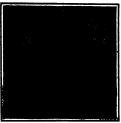
EMPLIES IN the Way certain apparent communions are personance. The processing is bessed on the merging of the three primary colors, red. Situs, and group it is not quite as simple in operation as the autochrones process that processes the fellowing defaults developing recently when the process of the process developing account of the sensitive pieces and keep better developing are constailly when netwest imports old and cost but half as much as the autochrome plates the positive trans-parentess are made by a separate process from the inlabel aspatives, thus permitting the making of any number of duplicates the transparencies transmit many times as much light as autochromes and are quite free from granularity so that they are perfectly adapted for use along with ordinary instern sides in the instarts also for use in the storeacopes the pro-oses also permits of local treatment to modify the colors when and where desired with autroordinary facility a feature which will be greatly appreciated by the artistic unstern as much as the autochrome plates the positive trans-

facility a feature which will be greatly appreciated by the artistic amasteur. A special camera is required to make the triple nega-tives but it is very simple and can be used without change for all ordinary kinds of photography with plates or films

When it is desired to make a set of triple negatives for color photography a trickmental plate and consisting of three sansitized plates held together as one is used in the special plates held together as one is used in the special plates be loider instead of a single plate and is so disposed in the camera after the plate holder has been inserted as to professor together three negatives representing the three perisary colors. The plate pack consists of a red sensitive and a green sensitive plate which is altaged thereto a sacking eard and a blue-sensitive plate which is hinged thereto a part of the plate holder the red and green-sensitive plate has been as a sensitive plate which is a larged thereto excluded. Simpained fills we parting on the life the bit-sensitive plate is made slightly shorter so that it falls or passes outward between the ledges. Which the obseque slide of the plate holder is withdrawn in preparing for an exposure this plate falls outward into the camera resting on the bottom of the latter in a horisontal position at right angles to the other plates When it is desired to make a set of triple negative ontal position at right angles to the other plates a horisontal position at right angies to the other plates After this a yellow screen plate is dropped down from the camera roof by means of a lever on the exterior as shown in the diagram and the usual compensating corem is placed over the lens tube. Then the ex-posure is made by means of the lens shutter which is

said to be about as long as that required for an autochrome place. Referring to the diagram, A is the lens having a compensating color screen B attached to it which equalism the exposure for the three images and perfects the color selection  $\mathcal{O}$  is a hinged transparent





The centre, physicider and carrying con-

The plate helder is inserted at the back of the camera under a ground glass frame held by springs is the usual way Focusing is done by moving the leus

the mean way Focusing is done by moving the lens inward or outward through a tube on the front. It is evident from this arrangement that the image-on each plate must be exactly the same but that two of them will be reversed one by reflection and the other because made through the glamp side of the plate

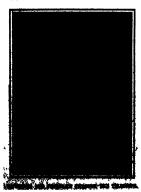
plate In making positive duplicates on the film it is only necessary to reverse the position of the print from the positive-positioned negatives to make all three positive prints evincifed when bound together between two glasses to form one harmonious transparent colored picture. The colloid no positive film is so this that accesses registration of the three films is not contain a colored print of the colored prints.

sflected. The exposed plates are developed by time development as a unit held in a special rax they being asparated opan. Hilke the leaves of a book in a special rax they being asparated opan. Hilke the leaves of a book in a time show no color but contain the rotior reveal times above no color but contain the rotior reveal properties above no color but contain the rotior reveal any time for making natural color prints the three To make the transparent color prints the three reactives are placed side by side in a printing frame A sheet of colloction bearing a canting of birhromated above to colloction bearing as canting of birhromated the colloction is dedown on the negatives.

the back of the printing frame put in and then ax too back of the printing frame put in and then as posture made to light through the negatives—about one minute in clearest smulight. The exposed sheet is then removed from the frame champed coated side up on a posture of the coated side up on a say for a few seconds. This gives two removes tay for a few seconds. This gives two removes the posture of the coated side of the coated of the they are then out spart and immersed in separati-ted bits and green of pse bath of or few minutes (the dyes to be furnished in their proper colors) then fined off dried and superposed in register t) make the off dried and superposed in register t) make the dyes to be furnished in their proper colors) then Irased of dried and superposed in register 1 make the complete natural olor transparenty. The same negatives are available for color prints on paper but the properties for making robor prints on paper most properties of the camera and plate, holder and the other carries and other the properties of the p

ery plate smok and positive section of the comparation is all own in the section of the comparation in the comparation is all own in the section of the comparation is all own in the section of the comparation is all own in the section of the comparation is all own in the section of the comparation is all own in the section of the sect

## WIRELESS TIME SIGNALING TO SEA FROM THE EIFFEL TOWER



## BY F HONORE The wireless telegraphic station of the Eiffel Tower is now signaling Paris Observatory time to all vessels

is now signaling Paris Observatory time to all vessels within a rodius of 1800 miles. The present station is using 15 to 16 borse-power When the new installation whose completion was delayed by the recent floods is finished 100 horse-power will be at the disposal of the employers and the range will be doubled. A master clock which has long been used for the correction of marine chromometra is set up in a room of the observatory side by rides with block that tole graph mean time to various contern in Faris and graph mean time to various centurar in raris and deferred clocks which serve to requists this mean time. The master clock in question itself indicates mean time with reference to the meridian of Paris. Inclused in a giase case and suspended from a wall so hisk that vibrations in manoury and variations in tempera-ture cannot affect the mechanism it is corrected each that viprations in masonry and variations in tempera-ture cannot effect the mechanism it is corrected each day if necessary by means of a magnetic regulator. The rod of the pendulum carries a magnet the lower and of which is spaced a few millimeters from a solen end of whon is spaced a rew minimeters from a sown old. Depending upon the direction of the current which is sent through the sciencid, the magnet is at irmstad or repelled thus retarding or poselerating the best of the pendulum. In this manner a lost second is regulated in thirty-six minutes.

The clock is connected by wires with the key of the vipules station of the lifeli Tower At midnight and lifeli, and at 12 64, the clockwork automatically



STATE WHITE AUTOMATICALLY TRANSPORTED TIME

completes a circuit, thus actuating a Morse key and

complete a circuit, thus actuating a Moree any ma-cantaing Heritain waves to be emitted. The observatory (seef its not equipped to seed wire-less signals but it receives the by means of a small serial connected with telephonic receivers. On the other hand by means of a More, key in the circuit of an ordinary belegraph system independent of the clock the wireless apparatus on the Billiel Tower can

clock the whreless apparatus on the Sillel Tower can be operated from the barvator.

At the proper time each day an official does a tel-phone beadpiese and proceeds to the work of notify lag vessals at sea of the orrect time. One finger on the Mores key but ye gived to the end of a reading telescope the official watches the beat of the pendulum All 11 of he of present the key and by means of agreed signals of the control of the pendulum of the control of the control of the control of the pendulum of the control of the control of the control of the pendulum of the control of the control of the control of the pendulum of the control of the control of the control of the control of the pendulum of the control of the con signals the h ur This transmission of time is re p at I twice as we have said namely at 12 03 and at 13 4 preceded y other combinations of warning sig-nals. Hence vessels receive the time thrice in five

The officer on board the vessel at sea is similarly quipped with a telephone headpiece and he watches e hro ometer instead of a clock Making due allow suce for jossible errors of observation he estimates the error of his chronometer

In last weeks 8 FNT > AMPR CAN SUPPLEMENT We hro ici d the fact that a new international language has made its appearance which is a strictly accentific internal by a new continual control of the control n pt made by an international commission of phi

way no waren no inagence producing the his mind which he was at the Warnew Garbert of the his mind with the waren the best of the work of

Some peculiarities may be accounted for by the Slavonic mother tongue of the author for example his preference for sibilants and diphthones which is cially evident in the invented words (e g chi especially evident in the invented words (e.g. ohi here chis each crk even ghi that ghis until gh and h being pronounced as E j and oh). In an arti-cle in Zamenhot's Krestomatio I find for example (p 288) hinj inj senantanjughaj kaj konestaj komoj kiuj anstatan filisofadi pri ghi and (p 298) tion chi kiej onstates Hisofote per phi and (p 383) Non chin-monoru of nois to apero de la suna orta largue accis-ve dia hoj antaudrite chiaj tiuj emmentoj leogo lutia to The method of writing z is also Russia chamerat chaemplo eta and also chaperi chaploidi also les for es Percula words with oi talas us in fin-also les for es Percula words with oi talas us in fin-sio les for est Percula words with oi talas us in fin-e g irristeror insiste vuola othemisa they are spoit with oi or oj e g forio jojo joso Neolo tredicio eta insisted of ciono in also Russian Russian temps hand den bitiem sho inspired units word formations as elgan-tation del control de la control de control del and erabispici insisted of the international promesori and erabispici function of the international promesori and erabispic function of the international promesori and evalue (Russian repiporeriet and invita si units ass dipens). The poculiativi of taling the adverts insisted of the adjective in such cases are rejue access essis its delens) The potolizativy of using the advarb instead of the sidewith in such cases as roise scores sold it is necessarily to exempt to be ascribed to the confidence of the sidewith the acute of the sidewith the sidewith the acute of the sidewith the sidewith the acute of the sidewith the si

# Scientific Assertants

of action expressed by oh and of (cheigh and coings) used in many cases where the simple yiel would be sufficient) are to be accounted for by Resaden tanges.

enflicient) are to be accounted for by Resisten angine. "Naturally I do not object to the importation of national pseudiarities into the international auxiliary and the state of the international auxiliary example one must make use of the facility for form ing compound words constant to the Germanies and Slavenic languages in the respect and combine it with the more Romance harmostrikit of forming the with the more Romance characteristic of forming the state of the sta

The unpractical nature of the circumfiezed letters has been indicated. It may be remarked here how ever that in point of system Eamenhof's letters are very inferior to the similar ones employed in the Csoch language since the parallelism in sound be-tween s and s and f ds and g is disquised by the choice of letters This produces a very amateurian

Seside the familiar parts of speech which are in dicated by special terminations Eamenhof invested a new class characterised by the termination ess (bos-t we observes) but the limits of this class which in cludes some but not all adverbs and prepositions are not clearly defined

nes not clearly defined Many words taken from existing languages are dis guised alphées after the fishion of Vefapith boji Franch choper perfere Franch per our a video German solvetieres English seems that Franch color frame instead of forsis leris, Prouch derive (with a changed meaning) set in this category is to be desired to be a consistent of the color of the changed meaning) or in the category is to be review from the Russian seprements of unit as if one were to take from the German word an extending the first two cylishes and propose sade as an interactional word instead of selective. The concentry in the color of t

treet deriva direct deriva stillealerly indi-lards out from some or to mean a origin so that coming whereas himself whereas a large of a king greened sport important which formed

estion of the best structions of an international language was not seriously discussed succeeded in producing one which seriously uncounter aspects on producing one which was in many respects superior to the attempts of that time and which has proved in practice a serviceable though very imperfect means of international com-munication

though very imperfect means of international communication.

The Gevernment and the Investor
We recently commented upon a bill which is being considered by the House of Representatives, the purpose of which is to compensate these investors whose layestions have been appropriated by the government. Since the publication of our remarks further test most has been taken before the Committee on Fatonia, and the second of the comment of the second of the comment of the comment of the comment of the control of the comment of the control of the comment of the control of the comment of the com

that sink positionals companies with the sink like that the country was highly a first the product was highly a first to any strain which was highly a first to any strains a sink of Potsition I finished, reasons a viscous a strain cost that chairs a finished product a way of the sink party Disputement and the like Potsition I finished the sink party of the last party of

This is so broad that the Government obviously infringed. The truliey greaten has since hom used in celestral the Davis torpolo grant. All Environment castals do the Navy Department saking for compensated for file use of his investment. The Navy Department registed that the Electric Book Company was making the span of the Davis torpolo ulthough as a master of files, the contents were actually conducted by reflever of the Anary Lieut. Commande Davis colorosisted the make any Lieut. Commande Davis colorosisted the make the company of the Commander Davis colorosisted the make the company of the Commander Davis colorosisted the make the company of the Commander Davis colorosisted the company of the Commander Davis colorosisted the company of the Commander Davis colorosisted to the Commander Davis colorosisted to the patient and price demanded and finally ended in a first retical to pay

prios demanded and manay merce, and the utilization by the Government of Prof. 2. A. Passenders, amino by the Government of Prof. 2. A. Passenders, and the property of the Prof. 2. A. Passenders, and the property of the Prof. 2. A. Passenders, and the property of the Prof. 2. A. Passenders, and the Prof. 2. A. Passen of the United States and have been sustained. In fringements of them have been enjoined. The united constitution and the interest of the control of the cont less material to the Navy Department Prof I ies material to the Navy Department: Prof Fessen
des protested against the Navy Department purchasing the material from the infringer calling its attent
tion to the fact that a court of the United Sittate. As the
explored it from turnitables seek material. The De
the Committee of the Committee of the Committee of the
explored the Committee of the Committee of the
fringer to work out their subvision as best they could
The infringer proceeded to furnish the material on
trusted for and delivered it to the Navy Department.
The furnishing of that material was used on the basis
and company were committed for contempt of court
and were fined
There is now pending in the Supreme Court on
There is now pending in the Supreme Court

and were fined.

There is now pending in the Supreme Court on writ of certiforari a case brought in the local court by the Krupp Company against General Croster Class of Ordnance in which it sake for an injunction to restrain him and his subordinates from making guas by the Krupp Company against General Crossic Chair of Ordannes in which it saids for an injunction to restrict him and his subordinates from making must of the surp seconding to the Krupp patent. When the case came say for decision in the Court held that regardless of the fact that General Crossic was an older of the District of Columbia the Court held that regardless of the fact that General Crossic was an older of the United Rists survey to derived no personal issue he was an infringer. The Krupp Company should confly for an infunction in this case and not for any compansation for the use made of its patent prior to the final decree An injunction on the loss and shorter of the Crossic Company chairs of the Company of the final charges and infunction in the same of the Patent prior to the final decree An injunction of the United Spains of the Company of the Company of the Conflict of the Company of the Comp

# 10 may

We disperseles. By the Government Ignores we proposed the control of the control

### New Trade Mark Bills

New Trude Hark Bittle

"As the trade mark law you stands the registration
by a corporation of a chainted trade mark which may
be a whole state to technical trade mark which may
be a whole state of the law of t name campt be registered as a technical trade mark That decision was regarded by the Patent Office as authority for making further decisions which are gen erally known in the profession as the decision in the case of the Champion Satety Look Company the Amulet Chemical Company the Union Carbide Com

amuse Comment Company no binon Carolec Company and the Success Company

The situation is anomalous The Champion Safety
Lock Company could not register its trade mark
Champion under the law as it now stands or as it
is now interpreted by the Court of Aglesis because pany and the Success The situation is an is now interpreted by the Court of Ali onle Decame the word Champion is a completues or sallent part of the name of the company while John Smith who has no rights whalever with regard to the Champion mark may register the trade mark Obviously this is unjust A bill has been introduced for the express purpose of authorizing the Patent Office to grant such

marks and to follow the letter of the law In cases such as the Union Carbide Company case in cases sich as the Union Carnice Company case there is, however another element which must be considered in this case the word Union may be regarded as geographical and Carbide of course as descriptive so that possibly this is a case where the descriptive so that possibly this is a case where the trade mark should not be registered unless it came under the ten year clause of the law But Success and "Champion and Amulet and such are obviously valid technical trade marks

walld technical trude marks
Another instance can be found in the word Kodak
as applied to photographic chaserss. That word is
underheldly a good trude usard. It has been sestatised by cearts of this country and ours shroad
for it is familiagle to registeration because the conthing and has the ownership of that mark has come
to a called the Bastiman Kodak Company Itseparate untuit that a trude merk which is a good mark
abouth, he unregistrable because it happens to be incorporable in the firm same or the corporate name of
the symbol.

expension in the firm seems or the convention state of the present control of the firm of the firm of the present control of the firm of the present control of the firm of th

### Correspondence.

### DISTILLING LICENSES

To the Editor of the Sourcette Assures I have seen in one of your Scienzisto Ames publications an article concerning Manufacturing Perfumes at Home You recommend a still for the distillation of flowers also illustrate such a still I wish to call your attention to the fact that su must be registered with the collector of the district in which such still is located not only before opera-tion begins but immediately after the still comes into the possession or custody of such person it be a new still distillery apparatus or not

It be a new still distiller; apparatus or not.

The law requires all stills est up to be registered. If for use or not This applies to all stills of whatwer sizes and for whatever purpose intended. Any still which is not registered is subject to for-titure, to the United States together with all personal property in the possession or custody or under the control is such person and forough in the building in which to such person and round in the building in which to register any still fibrilling to on on sently to fine and imprisonment under section 3158 Revised Statistic (Inharmal Revenue Department)

Kindly bring this to the sitention of your subserviers to avoid any difficulties.

scribers to avoid any difficulties

н н Рекомп mark N J

## RAISING THE MAINE

To the Editor of the Schemister American The recent act of Congress authorizing the raising of the wreek of the U S S Maine has given rise to or the wreek of the U S S Matine has given rise to many suggestions for raising her The wreek has rested on the bottom of Havana harbor for nearly twelve years, and has do bless settled considerably in the mud The Maine was destroyed by the ex-plosion of a submarine min which caused the par The wreck has plosion of a submarine min which caused the par-tial explosion of two or more of the forward maga rines Apart from the loss of life the results of this explosion were that the range | from the bow to frame 41 was terriby

Therefore it can frame 41 aft is a doubtful if anyth tered forecastic stroyed by dynamics. A new bow which could be which co ild be similar thing white Star line iish coast. Her which was held under her own docked. A new fast, towed to B within a year regular duties a tralian steamers. Brooklyn N Y 

# NOW LABOR BORN THE WAY APPEAR TO ME!

To the Editor of the SCIENTIFE AMPRICAT To the helitor of the SCHENIFE AMPRICAY
Ask two people how large the sun looks to them
when it is in mid beaven and you will get ten dif
ferent opinions of its size which range from a silver
dollar to a cart wheel The varied opinions are due
to the fact that there is nothing with which to com to the fact that there is nothing with which to com-pare it when looked at by itself. Before any accu-rate estimate of its size can be made we must have some known object with which to compare it. Thus when the sun is on the horison and appear

Thus when the sun is on the horizon and appears to be close to house frees and hills it looks very large To some people fit seems as large as a hour or tree. Moreover there are more persons who will agree that it appears to be a certain fixed size under this condition than will agree when it is viewed at the sential. The directly of opinion in the latter case the control of the latter case the lat

isolated object. This has been proved by projecting a narrow beam of light on a perfectly black non reflecting across no placed that the observer could see nothing but the beam of light and had no way of judging his distance from the across — The observations of servarial people under these conditions revealed the fact that there was no cartainty about the length of the beam the apparent length being estimated all the way from a few inches to servarial feet. This being the ones when the sea is in mid heaven they can it is not be reduced to come autifure stand over our like side by reduced to come autifure stand

are's most legical asserts in forms by representing the standard legical as a fine of detainen from the er-then never an extension of the standard legical and fast from the eyes when reading at this distance his sign institutes fairly sleesty the about the type or go light-greaten. In fact, is down poor, lutting of di-intalisms aim that the size of an illustration, that does the light legical and the standard legical and the light legical and the size of the size of the light legical principally difficult as small reaction of

an inch. These same men if asked to draw a circle on the sheet that would just cover the suns disk if held between them and the sun at a distance of one foot from the sye would produce a series of circles of magnitudes ranging from a twenty five cent piece to

The real size of the circle should be only three nths of an inch in diam

The method of representing the sun s exact size by a circle one foot from the eye is simple Take a smoked glass hold it one foot from the eye and scratch pin marks tangent to the suns lisk at the four quarters When the diameter of the circle in closed within these marks is measured it will be

found to be very close to it re-estimenths of an inch in other words if a circle of this size were draws and in its area were reproduced in proportion to an average a n spot the obs rv r would be abl to ex amine the small dot at a distance of one foot from his eye with just about the same ease that he could examine the real spot on the sun through a smeked glass Or again if the moon which is the same appar glass Or again it be moon writen is no manus apparent sits as the sun and whose disk can be represented by the same small circle were to be reproduced in miniature within its area an observer holding it one foot from his eye could examine it with the as scrutiny that he could examine the full moon with naked eye Detroit Mich

E C LANDIS

### The Current Supp

The British Antarotic expedition has started on its journey for the South Consequently the opening article of the current Surrynamar No 1798 in which the equipment of the expedition is described will prove of interest Not so many years ago in his famo book on education Herbert Spencer jut forth a po erful plea for the study of science Nowadays how ever an advocacy of that kind is not alled for an his book is at present largely of historic value only ans book is at present integer of historic value only Since that time the pendulum has been swinging too far toward the scientific Prof Albert G Keller in an article on Science and th H n antit s arg cs for the inevitableness of the h manities and of h manity the inertiableness of the h manifers and of h manify Be asserts not only that our lives may be enriched by the pravil of c it re in diverse from a not only that our lives may be enriched by the pravil of c it re in diverse from a not only that the contraction of the contraction and sood of the unit in the course of time the entire
see must descend to a law rive law argards physical
ad nental qualities Of late the aid f ugenics
ad mor recently still that of Wendeliss has been
syoked to keep the race at a high stan lard The
sethods adopt d ar outlined in an article suttil d Empencion adopt u ar outsined in an assistance and mendelism Mr Paul F Bauder writes instructively on the quality of light A sympathetic and appreciativ biography is jublished of the late ann appreniativ piograi by is luminated or the aixe Sir William Huggins Hithu Thoma n contributes a the ghtful paper on atmospheric electricity One of the most interesting problems of archaeology bas been solved by the revent accavations at Ariesia that an cient city of Gaul where Vercingstorix headed 80 000 countrym n in a last gallant though futile at

> Grear The wonders of these excavations are told in an interesting article Mr Leon A Hackett contrib t s a very exhaustive paper on the processes of cotton The removal f ashes by one ying them to a waste bruk hydraulically is done in connection with the temporary plant built to suppy power during the cons ruction of the Mainbow Palis hydro-cle tri de velo; or t of the Great Falls Water Power and Jown site Company on the Misso r River near Great Fa is site (company on the Missor River mass Great hais side of a hill directly above the edge of the river bank the bitumin o a wal used is dimped by gravity from cars on a meaning to a bin at the rear of th firing floor of the treat to a on at the rear of a ning moor of the boil room and runs down on this floor from which it is fed by hand to the furnaces. As the sales fall through the grates they are drawn out into a trans verse concrete-lined trench in the firing floor. This sen is sloped to one side of the building where trench is sloped to one side of the building where it connocts with a finne extending on a grade of about five per cent to the edge of the river bank. When the grates are cleaned the ashes are pulled into the trench and a home stream turned into the latter t start them. They are thus pick d up by and ar ried out to the river through the flume mly a small rest out to the river through in nume inly a simil-amount of water being required. No difficulty is ex-perisoned from clogging in the trench or fitme and the current is the river prevents an accumulation at the edge of the bank

tempt to stem th advance of the victorious legions f



### FUNG. GARDEN OF

BY JACQUES BOYER

The Mycothique annoxed to the laboratory of cryptogamy of the Paris school of pharmax is un questionably the most original garden in the world it contains it ing speciments of 107 species of moldan dillifed fungle which M Bainter has gathently collected separated and cultivated on an appropriate midlum

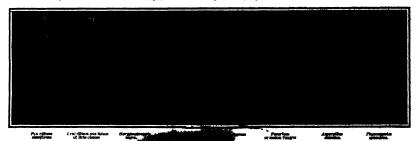
medium. The fungi are sown or planted on pieces of liceries root in bottle of lishemian glass about 3 indeed in the first state of lish minn glass about 3 indeed in the first state of the theory of the high of cotton woul A glass root the top of which is calarged to form a cup in which the top of which is calarged to form a cup in which the pieces of liceric root are placed passes through an India rubber stopper which is fitted to a bole in the bottom of the bottle. The ministrate granulouse rests bottom of the bottle. The ministrate granulouse rests on a base of wood or perceisin

staments of Fentcilium at first simple and laker branched and resembling a brush bear chaplets of green gray pullow or reaccioned appras Minate drops of water often condense on the brush of Fent-in color to cheal a parts and toolated species in tack bottle interlopers of other species are carefully removed and the bottle if necessary is replanted two or three times The principal function of the collection is to supply the showstery with living speciesment of assured purity of type for use in research and in the limitation of besteres

illustration of lectures

The position of the curator is no sinecure When the
nutrient material has been exhausted the fungus will
perish unless special methods of preserving its life are
adopted M Bainter having learned by experience

number of Rure the two-fold per and of converti oxide Among these species is Much which is frequently seen growing on de which is frequently seen growing on decay; takes matter Physosopocote spineless exhibit coate diamonts terminating in Hitle balls. I species, P sitters, is employed to heighten inney of carmins by concentral the fatty frequency of contineal The single spuns Perioditions specied by 17 apoles. P pleasants in the column and which actions bysed, fruit and other as food Varieton sorts of chosen see Capital Science of Concentral Contracts of Proceedings of Proceedings of Proceedings of Proceedings of Proceedings of Concentrations and Particular Contracts of Concentrations and Contracts of Concentrations and Contracts of Contr



The literice roots are deprived of their cork like bark in order to lay bare the yellow alburnum or sea wood which is filled with glycyrrbisin a saccharia substance which is very favorable to the development

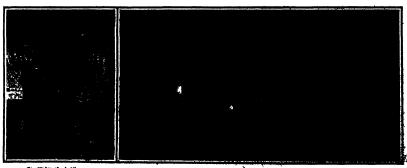
Before the moid spores are sown the bottles contact ing the pieces of licorics root are sterilized by heatin them to 248 deg. F for one hour in an autoclary Our of the accompanying photographs shows Baini is its the spores by removing the cotton plus and depositing a few spores on the licerice root is means of a platinum wire sheathed in a glass re means of a pixtimum wire sheathed in a giasa ro The pixtimum wire is sterlisted by passing it through the flame of a Bunnen burner before it is dipped sig-timated by the source of the control passing in the jaced after the source The bottles them passed in jaced after the source The bottles them passed in macelium of the fuguas rapidly permeater the liceries tock which becomes covered with a growth which wires greatly in appearance according to the species space-pholosterium develops a dense mass of long grayths hairs. Jeriet forlies rescribed a shrind with many branches and devositioners are received to papearance of a while foll that The reproductive

most interesting sides. Among the 37 co brief. Among the 37 co brief. We observe Mucro-watch, the settlement between made with the settlement of the settlem used in gase Orient in the production of respected fluquous from rice Amplomators Rossel or Chinese yeast which is used for the same purpose by the Chinese and was introduced into Europe by Dr Cal-mette director of the Pasteur Institute at Lilie find a

duces the characteristic green veins

The genus Aspreyfilles is represented by 6 species
A crises is used in Japan in the formentation of the national beverage sake or rice bear A fundation at tacks the mucons surfaces of the respiratory organs of birds and produces a pseudo-tuberculosis in pigeosa chirds and produces a pseudo-tuberculosis in pigeosa chirds and produces a pseudo-tuberculosis in pigeosa chirds and continued by the creaming process. There are is species of Streymentoporties including the constructed of said (also catalité attention) which was replicated to catalities afternishes speech which was a respective of the construction of the continue various tungs which are parasitie upon insucis including Corréctory which he forst caterpillars and Bortytis of which one species causes the muscurine disease of alliworms and others have been employed to destroy May besties and locusts.

Alfred M Angot director of the ma to of France has reported to the Academy of Bel cases that no exceptional variations in terrestrial magnetism or estimospheric alectricity were observed in the neighborhood of Paris during the night of May 18th 18th when Halley a comet was in transit. The meteorological observations also failed to indicate any disturbance that could be attributed to the



Steriligher the bottles.

Pleating the Impl.

spores of each M, arranges his week one or

of cryptogams

ture has led to blished descrip-fact that the

congrated from organs of one

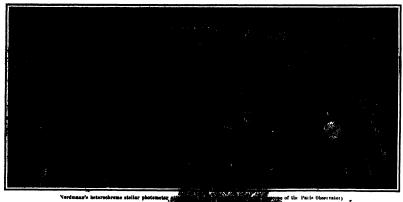
# THE TEMPERATURE OF THE STARS

## BY JOSEPH BARTON

By masse of his heterochrone stellar photometer. Carbon Nordinaton has succeeded in obtaining in a first of the stellar photometer has succeeded in obtaining in a fit the effective temperatures of certain stars. The siparatisa consists of a interal attachment to the symptom of the obtained in the consistence of the obtained in the obtaining the obtai

circular aperture the light of an Osram metallic filament lamp of four volts and one amper. This little lamp is operated by atorage hatterics and regulated by means of a rheestal and an accurate volt moster. There is no difficulty in mantaining the difference of potential between the lamp terminals on stant to within 1/100 volt by adjusting the rheestal cone or twice per hour. This corresponds to an in

various temperatures between 3880 deg F and 6 00 deg F these temperatures being measur i with the with the small horizontal consistent of the Observatory of Paris and the photometer described above that this neethed of monoh remain: inmag a gives in a simple manner the measurements and ratios of the total luminosity of stars free from the



star This part of the apparatus contains two Nicol prisms the third Nicol and the quartr plate of Zoll has a photomistic bring suppressed Furthermore being suppressed Furthermore being suppressed Furthermore between the focus and the sysphese in the common path of the rays of the real and the artificial star is placed a silding drum which carries interchangeable cells filled with colored liquids In this manner a series of mono-chromatic images of the real and artificial stars can be produced. The photometric measurement is made by rendering the images of the two stars can be produced. The photometric measurement is made by rendering the images of the two stars can be produced with great stars which prices the field star and are provided with great-scatteries. The artificial star which performs the function of a secondary standard is obtained by converging upon a

is the storm inherent to the old; processes it state furthermore the solution of certain problems hayasical astronomy especially the measurem of the temperature of stars. If determination of stemperature is of stars. If determination of disperature is studed ont if at that it is it a few following the state of the s



Significations the photometer with the aid of an electric furnece.

# The Flights of Rolls, De Lesseps, and Curtiss Compare

BY CARL DIENSTBACH

The "beavior-than-air machine' during the past few weeks has proved mearly as useful as the large modern airship, that has aiready been commercialized When Biferiot first fiew across the English Channel, swroplane Biferiot first flew across the English Channel, suroptane traffic seemed near But as nobody, not even his rivals in that attempt, repeated the feat, his perform-ance gradually lost its convincing quality. In Ger nany his feat was dubbed a "mere piece of good luck When, however, during the last few weeks, the Chan nel was not only crossed again on a Biériot machine,

nel was not only crossed again on a pierro measure, but in quick succession the whole navigable length of the Hudson was covered in a splendid high-speed flight, and spiendid high-speed flight, and when on the heels of that triumph the Channel was crossed and re-crossed in a single flight, everyone realised that the aeroplane had on tered upon a wider field of useful nd that it was indeed a vehicle which is destined to be the pleasure conveyance of the future The three flights mentioned were all over established routes of the liveli est traffic They all required a ma-chine which would not fall, under ceime which would not rait, under penalty of falling into the water, and they were all between rocks or precipitous mountain sides, which made it a problem to land in case of emergency, and which influ enced the air currents in a way as yet so little known that even a sephyr might become formidable aspayr might become formidable That they were successfully accom-plished by machines of so widely different types as the Biériot mono-plane and the Curtiss and Wright biplanes shows to what extent the technics of flying machine construc-tion have advanced witch the basition have advanced within the pe year They especially emphasise the immease progress that has been made with regard to the heart

been made with regard to the heart of an aerojalane—Its motor It seems now certain that the aeroplane motor will merely repeat the history of the automobile on gine It offers certainly a more corrulable problem, but it seems now assured that the continuous filters of the certification of the certificat now assured that the continuous falling of the early flight motors was due less to the inherent diffi-culties under which they had to work—running almost continuously at top-load—than to inexperience of at top-load—than to inexperience of the makers it should be pointed out that the Curties and a Biériot machine aithe fiew with half the power with which they were provided for these trips. They were not larger than the standard type-but De Lessops had a 50 horse pow but De Lesseps had a 50 horse pow or Guome motor in place of the 24 horse-power Anzani with which Bidriot flew across, and Curtiss also a 50 horse-power eight-cylinder motor against the usual 25 horse-power four-cylinder engine of a Curtiss biplane Capt Rolls had made no attempt to double the mo-tive power of his Wright machine, but as he was flying alone he had considerable reserve force at his considerable reserve force at his disposal Tarse were all machines capable of carrying a passenger, but flying with only the pilot aboard Consequently the motors were not running continuously under top-load any more than automobile

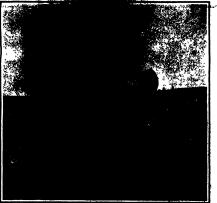
der top-tona any more than automobile income. Count de Lessepa used his power sparingly He made little better time than Blériot. Even Curtiss, who was beating the "Twentieth Century Limited," says he rarely opened the throttle wide

There is another feature common to these flights, to es must be ascribed just as much as to more reliable motive power. It is the evolution of high flying. For trips of this nature a great elevation has the very obvious advantage of easy reckohing. De Lesseps flow in a fog, yet, in contrast to Biériot, he almost always in sight of land, at an altitude of was animed aways in signs of stand, at an attitude or a thousand feet, as compared with Bifrico's 200. From the same superior level Curties saw the scenery perced below thin like a clear. He could make short cuts, pick his landings, and easily decide where belt to lay his course. Firing bigh greatly simplifies the plicit task, where low firing would add to the difficul-

ties of balancing, the difficulty of following a more or less circuitous course while dodging obstacles, it is means something like the strain on a hyerde rider, who with his eyes glood to a country road, tries re-centantly to pick out a path. Though a flying pitch does not fear actual contact with objects below there still remains the need of allowing for leavely not of wind causts, irregularities of the motor or swaying the machine The principal advantage of being also go high is, however, in the increased "range" it gives to dominating the last itself.

College College College





De Lemops in his Bieriet menoplane flying across the Chambel. THE SECOND AND THIRD ARROPLANTS TO FLY ACROSS THE RESERVE GRANNEL.

Aviators are fast realising that it is better to equip aerial disturbances than to fight them. This tends is prevent them from following any route that approach the confined character of a readway. The real shie issues of flight may be found only it the 

doubt isuraid this trick while The Hudson River is known water. He had no do

cellars vaguely suggest of old carties. If we bright Sonday when Curtist his epoch-making Sight to York, the greatest safety for the water in such a rive

As a feat of nitrigation Curtiss light excelled De Lessings an Rolle's journeys across the sec. If had to deal with much more varie had to deal with much more regime conditions of the air, just as change ing as the topography of the light scape over which he was possible it is not preprising that on his It is not sarprising that on his long trip he secontraved that hughest of the aeroplants, decombine outwents, that was more familiar to aviators in the old days will deal to aviator in the old days will day will deal to aviator in the old days will day will deal to aviator in the old days will deal to aviator in the old days will day wi peen sought, titining in a sam is so uninteresting, the machine in "dead air" seems so inert imd devoid de power, that Littenthat, Phoffer, "levring, and Avery gladity pre-ferred to risk the gusts instead. Curtiss only reiterates what Her-

ring fourteen years ago so elo-quently described, when he raters to a feeling at the pit of the stom-

questry described, when he ruders to a feeling at the pit of the storiach lithe that caused by a quickchange in the level of flight of 
twenty to forty feet.

Curtias's impenious use of the 
horizontal rudder in meeting these 
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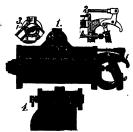
# Scientific American

AND SERVICE Laterit Department

AF ENTERTHE WATER MOTES.

AF ENTERTHE WATER MOTES.

Figlicity in the accesspancy engraving is an insecond hydrogeneous piece. The moter comparison
industry is the accesspancy of the price, as that the
nodes will consider the price of the type on bodying a cyrineindustry in the price of the price, as that the
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the thin of the rises consists of two creambands conborded by a pair of coil springs. The upper creamband
degreed to essages a rocket Z. The little is comment
by a root and crunk to a valve in the valve cheef. The
value is shown in Figs. I and it It consists for
it is a superior of the passages of or f, while
the other of the passages in concerted with heat as
heat port Z. In operation, when the rative is termed



HOVEL WATER MOTOR.

to the position shown in Fig. 3, water will be admitted through the passage H for the left-hand side of the platen, forcing the latiar toward the right and cashing platen, forcing the latiar toward will cause the robot it will cause the robot fame to awring out, making the roller carried threaty hear on the robote ram B, and this turn the valve F, so as to connect the port s' with the inlet G and the robote frame will cause the rocker frame to maintain the rotting to F. The springs on the rocker frame will cause the rocker arm to maintain the position of B is needed upon the points of the position shown the place I. The investment of the water motive is Mr. ball. It has the results of this water motive is Mr. ball. It has the results of this water motive is Mr. ball. It has the results of this water motive is Mr. ball. It has the results of this water motive is Mr. ball. It has the results of this water motive is Mr. ball. It has the results of this water motive is Mr. ball. It have the rocker water than the results of the water motive is Mr. ball the results of this water motive is Mr. ball the results of this water motive is Mr. ball the results of the water motive is Mr. ball the water had the state of the results of the water motive is Mr. ball the water motive is Mr. ball the water had the state of the water had the state of the results of the water motive is Mr. ball the water had the wa

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reserved whenever statistic by turning it astore with-directing it from the themse, A silgat is defined as directing the constitution of the following states of this flattening devices matter than the con-tinuity to the schimzey by means of spikes, Y-to-take the pince of the sears O as well as the ear J The store pinc is provided with tongues which are underent, forming grooves in which the spikes are received when the pipe is given a partial turn. The



INTROVED STOVE FIFE AND TRIBULE FOR FLUX OPENINGS

pipe is formed with a bead edapted to engage the finance B, which forms a next closure in case the pipe does not perceively if the thimbis. When the pipe is withdrawn, the opening may be closed by means of a co C, which is previded with grovens II, like those on C, which is previded with grovens II, like those on D, which is previded with grovens II, like those things are pipe. The birector of this store pipe and things in M. Ambroon II Modells, of Developert,

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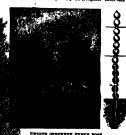
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Brief Notes on New Inventions. rine boat is son

is passed. Any number of these brackets may be arranged on the word thermostics as however, it is particularly adapted for this frence post that it is particularly adapted for exist leads because the state of the particularly adapted for exist leads because the wires being knocked down, and therefore would be wise being knocked down, and therefore the wires being bracked in the gravity lessened to blocks are aphorical, they are less scally futured to blocks are aphorical, they are less scally future by frost or worther conditions. The fonce post may easily be taken apart and packed in a small space for shipping. The inventor of this frace post is Mr Charles T Howell, of Gles Ffors, Wis.

A fence post of concrete blocks which is

A pump post of controls before which is of a decidedly unique yet in illustrated in the accompanying capturing it consists of a series of blocks of controls before of blocks of controls the control of controls 
The presence of a submarion beat is sometimes made known to the enemy by the train of bubbles that rese to the surface of the water from the gasenatine ac-hast. These bubbles are residily discernible, and indicate the course which is being pursued, thus ma-abling the enemy to take measures for defense or a counter attack. In order to prevent a submarion beat from befortying its course in this way, an inventor has devised a method of relating the exhaust game, pur mitting them to escape only at triguilar intervals in The pre mitting them to escape only at irregular inter



UNIQUE CONCRETE PERCE POST

rge quantities. Although the single large gas bub-e thus produced would indicate the position of the bmarine, it would not give any information as to the direction in which it was traveling or its rate of speed direction in which it was traveling or its rate of speed. The exhaust games of the engine are led to a gas puri-fer and cooler, and then enriched with oxygen and passed through the engine again, so that the engine works in a closed crycle. An automatic valve serves to carry out the games, when they reach too high a pressure, and remnite them to a receptacle, whence are related to the control of the control of the con-trol of the control of the con-trol of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the control of the con-trol of the control of the control of the control of the con-trol of the control of the control of the control of the con-trol of the control of the control of the control of the con-trol of the control of the control of the

they may be remained by sever desired.

In case of fre, so the time-honored directions run, throw a mattrees out the window and then jump down on it. As a mattrees may not always be handy, as inon it. As a nativese may not always be handy, an in-ventor of this city proposes that fire companies be equipped with mattress trucks for the accommodation of these who have been traupled in a burning build-ing. He has invented a truck provided with a plan-form which carries a series of bed sortings and mat-treases and which, when brought to the seven of the fire, may be elevated to a considerable height, and the second-story windows, and moved inward toward the building so as to bridge over the arressary bris instance can then leap from their windows to the matterss.

There is nothing a fireman dreads more than which produces volumes of dense amoke, for it is im possible for him to get near enough to the seat of the fire and to see clearly enough to direct the stream of water properly Various devices to enable a fireman are and to see clearly snough to direct the stream of water properly 'Arious derives to enable a firman to breathe in such conditions have been proposed from time to time. A novel scheme of this sort has just been patented. It consists of a pair of beliove occu-nected to a water wheel in the besse near the bydrant, and operated thereby to open and close alternativity. Preach air is thus pumped through an auxiliary plo-conducted shoug the main home to a mank which is wan by the frequent.

orn by the median.

In the raining of such vegetables as asparagua, reen calons, pie plant, strawberries, and the like, it



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The same of the same

is customary to force the growth by covering the beds with glass. This is rather a cumbersome process, as it involves the construction of frames over the plants, which must be dismantled before they can plants, which must be dismantied before they can be removed to a new location. Furthermore, the besting device that is sometime employed must be moved as well, which is rather an expensive operation. An improvement on those conditions has been suggested recently it consists in the use of a portable greenhouse and a separate portable besting plant, which may be connected to the hesting plant which may be connected to the hesting plant which may be on the greenhouse in mounted on wheely, which travel on tracks or ways. The ways are semporarily haid whom moving the greenhouse from one place to another

porarily had whom moving the greenhouse from one place to another.

Two interesting patents on drinking cups have re-critly been lessed One of them provides a folding-pocket drinking cup, which consists of a place of fixible asterproof material folded upon itself to form a cun without any sessus through which the water may less. The cup is covered by a strip of testher, and may be collapsed to form a fait necksage, so that it other cup referred to is Angived particularly for use other cup referred to is Angived particularly for use at welds foundating and public dispensaries of beverges it is formed of a hand of parafice paper connected by It is formed of a band of paraffine paper connected by an overlapped joint. The bottom of the cup is made out of a star-shaped blank, the points of which are folded up on the sides of the cup, and serve not only to attach the bottom to the cup, but to reinforce it The cup is made of tapering form to permit of nesting

Mr Dexter M Rogers, of Boston, Mass, has dedi-cated to the public an insect-destroying bomb upon which he has just secured a patent. The bomb contains dry poisons in powdered form, and is arranged to be exploded when it reaches a certain height after in ing discharged from a gun. The poisonous powder is thus distributed in the air, and gradually settles is thus distributed in the air, and gradually settles down on the leaves of the trees which are infected with the insects. This method of freating the trees po-sesses the advantage that the powder will reach all parts of the foliage, and is applied with a great gaving of time and labor

PATRITED ODDITIES.

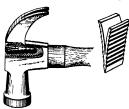
GUN BORE SIGUETIAN THE ARCHYA—A rather ingenies method of testing the sightle of a gun has recently patented by a German inventor it rousists in page the telescope in the bore of the gun, with its like



TELESCOPE FOR TRETING GUN SIGNYS,

sight parallel to the axis of the bore. The sightling device is then set to its sero position, and the gun aimed at a distant object. The eye-piece of the take scope, which is shown in the enlarged sectional view, is fitted with a prism, so that the axis of sight inter-sects the line of aim at the eye in this way it is possible to make an observation by merely moving the eye to change the direction of vision, as indicated by the broken lines, whereas heretofore it has been necessary to move the head or even the entire body, in changing from an observation along the sights to one

Richitive Wisher For Tool Handles—An invento in New Moxico has recently hit upon the ingeniou scheme of using a resilient wedge for fastening th



RESILIENT WEDGE FOR PASTERIES TOOL BRADE

heads of tools upon the handles, the advantage of this boing that when the wood is compressed through the use of the tool, the wodge will expand, and thus auto-matically tighten the handle The wedge as illus-trated herwith is spitt, and is provided on opposits

faces with ratchet teeth that serve to prevent its with-drawal from the wood. The tool head should also be formed with ratchet teeth inclined oppositely to those of the wedge, so as to prevent the ha ndle from helms withdrawn.

withdrawn.

AID-COGLING FAR — It is well known that the circulation of air increases the rate of evaporation, and thus
cools a moist body. It is for this reason that we use
a fan to produce an artificial draught of air over the



SELF-COOLING PAN.

face and absorb moisture from the skin. An inventor has recently hit upon the idea of improving the ency of the fan by providing it with a moist pad, efficiency of the fas by providing it with a moist pad, so that the swaporation will occlu the fan. The fan is made up of a rattan frame, as shown in the accompanying drawing, which is covered with two layers of cloth, between which is a layer of felt. The cloth layers may be removed to permit of taking out the fail layer to moisten it Undoubtedly, when the fan is fall layer to moisten it Undoubtedly, when the fan is fall layers on the removed to permit of the contract of t



MARROW WITH AUTOMATIC LIFTER.

sanying sketch illustrates a method devised by a Gorman inventor of producing this motion automatically Extending transversely across the drag is a rod or shaft, which at each nod is provided with legs pointed at the ends. These logs are oppositely mounted so that, as the drag is drawn along, first one are not the other transversely the other mounted so that, as the drag is drawn along, first one leg and then the other engages the ground, serving temporarily as a futerum about which the drag swings in an arc. As a result, the drag is caused to pursue a signag course as ross the field.

BYUM-SULTITE—The usual method of removing

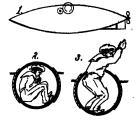
nps of trees from the ground is to split them by use of a wedge or a blast of dynamite. The so-



Course great marries.

consequents (the relief, since the latest and the state of the state o parts, these parts can easily be excavated and

HATCH YOU BURNARING HATCH YOU BURNARING BOATH.—When a submarine book has been disabled and sunk, the occupants dare not attempt to escape, for if the hatch should be opened there would be an inrush of water,



LIFE-GAVING MATCH FOR SUMMARINE BOATS.

which would drown the crew before they could e which would drown the crew Detere they count ex-cape. An inventor has recently hit upon an idea, borrowed possibly from the revolving doors that are used in public Apididings, whereby the craw can ex-cape, one at a time, without admitting more than a once in public\_Politonings, whereby the crew can each, one at a time, without, solimiting more than a measured quantity of water at each operation of the habit. In this case a cylindrical latch is used, provided to the public of the water department of the water of the public of th

very simple press for this purpose, which allows of



### INTERPRED BROWNING PROCE

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# Modern Steam Engineering in Theory and Practice

By GARDNER D. HINCOX, M.R. Peter 68.66



# Punches, Dies and Tools for Manufacturing in Presses

By JOREPH V. WOODWORTH



Modern Plumbing Illustrated



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A TRIBPRODIC STRINGSCOPE.

A TREASPOSTIO STATEMOROUSE.

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The instrument has also been anapted to other phases of work such as the electrophone and wireless telegraphy with similar success. In this former case when the receiver is connected to a trumpet the sounds are distributed through out the room, while in connection with cheric belegraphy it has enabled in pulses, which were so breble as to be undetected, to be picked up, and distinguished the product of the programment of the pr

# THE PLEASE OF ROLLS, HE LESSEES AND OVERTIME COMPARIE. (Continued from page 50%.) Seat of one of these machines under any

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De Lessage used a 1810 Mércio for his contraction.

De Lessage Signit. This model is not greatly changed from the machine that carried Mércio Agrees to Bogfand It is compared to the contraction of the contraction

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1910

to 1000 for All, Repedit, 16 Simile World's record for endurance (and filter ropky Cup), won by Yele Team (1), July 197, 600 miles aveniging 20 miles per hour; partect accre—no industretta—and gano-trace accre—no industretta—and gano-trace accre—in the perviously won F. A. M. adurance Contents for four years. Non-stop engine test, January 24 to 29, 28 hours Indoors, without fan or any other cooling device. Begine was then stopped cooling device. Begine was then stopped cooling device Begine was then stopped cooling device.

VEHICLES OF THE AIR

By V. LOUGHEED

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(Continued from page 550.)
Wright biplane before, it is safe to surmise that his cross-channel fiver was one
of the new, powerful Franch Wrights,
with a double horisontal radder (a surtace in the rear added, which as in the
Farmsin machines, acts in unison with Farman machines, acts in union what the front rudder) This is in accord with the Wrights' tendency to increase the power of the controls to the high-est possible pitch, and at the same time it acts somewhat like an automatic steadying device. Any surface in the

rear tends to steady
In practical results Curtiss's flight may
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precedented sustainst mead over.

short period of ealth is reselv difficult in find, but that during such a period a Curtiss mackine with its dapacity for ervices of the greatest practical usefu nees. To many a business man it migh be highly desirable if he could cover a dis be highly desirable it as some cover a dis-tance like that from New York to Al-bany, between places; where there is no direct sallroad compaction, with a speed excreding that of the fastest express train, with comparatively slight and whonever half a day's calm can be counted upon In war, the Cur-ties type of machine may become a de-cisive factor in spite of its comparatively

factor in spite to income anying capacity in weather may be dreaded like the her the commanders-in-chief of fuplanue by the come plague by the commanders in-ohler of trure campaigns. The small, speedy Curtiss machines may be as immune from attacks from the ground as maquitoss in the air. They may not only scent but also pralyses operations, not by throwning dynamics (their small supply would be exhausted before any great de was done), but by setting things after with the smallest quantities of burning chemicals—a modern revival of the



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# Topic 18, 1910 THE TREFERENCES OF THE STADE

of Transmantain of The State of the Confession of the C signess very well with the values of-def for the temperature of the sun, by nemetrie or pyrheliometric methods, Wilson (6778 dec. C., or 10,465 dec., Schainer (4800 dec C., or 11,182 dec., and Fery and Millochau (5800 dec., or 5500 dec. F) he following table contains some of dimann's determinations of the tem

|                        | TEMPER  | TURE. |
|------------------------|---------|-------|
| MAME OF STARL          |         | DEG F |
| Persel                 | 2870    | 5200  |
| in Cephei              | 4260    | 7700  |
| Sama Cygni             | 5620    | 10150 |
| Herculis               | 7350    | 13250 |
| Ballirla               | 8900    | 14800 |
| Alla Lyrae             | 12200   | 22000 |
| Persei                 | 13300   | 24000 |
| Chamma Lorse           | 14500   | 26100 |
| silon Parsei .         | 15200   | 27400 |
| Dalta Persel           | 18500   | 33300 |
| mbda Tauri             | 40000   | 72000 |
| andenendently of these | thormal | mass. |

pendently of these therma: meas nts. Nordmann's method, in con with the spectral analysis of ves information concerning their rative stages of development. These by high temperatures explain the t in some of the stars the spe pe reveals the existence only of ele the like hydrogen, nitrogen and car and the compound of carbon. and the compound of carbon and ogen called cyanogen, which is in ciable by heat

rdmann's apparatus also many new prospects in photometry, a missione which is still in its infancy, ex additioned which is still in its infancy, or, the still is a season to stellar radiations, and the season and the season and the season and the season and the stillar radiations, the season and the stillar universe of the constitution of the stellar universe of the constitution of the stellar universe of the constitution of the stellar universe of the season and the stillar universe of the season and the stillar universe of the season and the stillar universe of the stillar univers mers have thought less difficult to follow than it really is In determining stellar magnitudes, the American and Gorman observers muraly measured with the photometer the total luminosity of each star, but, as the stars are of different colors, the values thus obtained are af fected by errors of physiological origin Furthermore, it has long been known that estimations of the brightness of variable stars, especially red stars, exhibit great individual differences. A com noni great individual dinerences A com-parison of the catalogues of Harvard and Potsdam shows differences in the record-ed brightness of red stars. If in one se the ratio of the brightness of a med star to that of a white star is resented by E. it will be represented in the scher catalogue by \$/2E. These system atte differences appear to be due to two distinct causes. The first source of error purely physiological and consists is the fact that sensations of color are produced by the excitation of the termina finments of the optic nerve, which line the retine, and which are of three d ent sorts, sensitive respectively, and a most exclusively, to rays of the red, the green, and the blue and violet portions of the spectrum. Now this relative sensihe spectrum. Now this relative sensi-teness varies greatly in different indi-shible, as is strikingly illustrated by the physics and pathological case of Dalton-im, or odor blindness. The lumipous spreases the pathologism case of latton-man or color blindows. The lumiposes admitted produced by a gives star, that makes the color of the latton of the color special produced by a give star, that special colors in different individuals. The second casting of error is found, ap-parently, in the phenomenon discovered by Particips, which pays be expansed as follows: If two sources of light, one him and the other red, appear equally bright to the error, and if the brightness of each nowne in the dischalated in the same proportion, the red light will appear less special than the latter The redirect of the color of the color of the colors of the special than the latter The redirect of the special than the latter The redirect of the special than the colors of the colors of the special than the colors of the colors of the special than the colors of the colors of the special than the colors of the colors of the special than the colors of the colors of the special colors of the colors of the colors of the special colors of the colors of the colors of the special colors of the colors of the colors of the special colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors of the colors of the colors of the special colors of the colors



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star and the aperture of the telescop Additional complications are introduce by the age of the astronomer the position of his eye in respect to the eye the degree of ocular fatigue, etc. eliminates these errors in the determina tion of the total luminosity of stars makes possible an exact study of the colors of stars and of the dispersion of light in interstaller space Finally, it will undoubtedly give information con-cerning the intrinsic mechanism of the strange and mysterious transformations of variable stars of all classes

Dr Franz Linke director of the Me-corological institute of the Physika-scher Verein at Frankfort-on the Ma.n. has published a report on the special storm-warning service that he organized last summer in connection with the inter service, being the first of its kind, was exportmental, but proved so successful that a similar undertaking is likely to be a feature of all future aeronautical competitions on a large scale, especially if held in a region of frequent thunder-

The prediction of large general storms services that now exist in all civilized ountries Local storms, however, and difficult to forecast on the basis of the widely scattered reports that make up the ordinary weather map and that are all that the forecaster ordinarily has at his command The attention of the fort service was directed especially to the prediction of thunderstorms. The life history of these storms is now well understood thanks to the brilliant in vestigations of a small group of me-teorologists of whom M Durand-Gréville is the most conspicuous. In the great majority of cases they aween across the country in a long line that may be compared to the front of an advancing army
—the "thunderstorm front"—at a speed averaging, in Europe, about 40 kilometaveraging, in Europe, about 40 kilometers an hour The line of advance keips a position more or less parallel to itself, and its progress is not difficult to preddet, if its oxistence and position are known at any given time. The prerequisites of successful thundrestorm prediction are a dense network of reporting stations and a session of accounts tole.

graphic communication with the central Dr Linke engaged the services of fifty five observers constituting a picket line of 150 kilometers radius around the city of Frankfort These were mainly recruited from among the volunteer ob cruited from among the volunteer on servers already reporting, but not by telegraph to the existing meteorological institutes of Southern Germany These persons were requested to send an 'urgent' telegram to Frankfort whenever a thunderstorm or a wind-squall (which is first-cousin to the thunderstorm) ap-peared in their vicinity between the hours of 7 A M and 7 P M The compensa-tion offered was a free entrance ticket to the exposition and a copy of the pub-

stations and a system of adequate tele

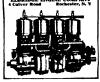
The result of these arrangements was most gratifying, as, with one or two exceptions, all the thirty-seven thunderstorms that reached Frankfort during the three months of the exposition were duly hersided an hour or more before their arrival

It is noted that no air rait attempted to fly in the face of providence—and the weather forecaster—except the big Zeppelin," which began its famous voyage to Cologne against the advice of the fore easter and promptly ran into a heavy

The entire cost of the service was only 800 marks (\$150), an insignificant amount compared to the value of a single lives of aeronauts, an effective stormwarning service accordingly offers a cheap form of insurance













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Hamilton's biplase traveling above and benide the locemotive of the special train during his flight from New York to Philadelphia and return on June 1816.
THE LATEST FORM OF RACING —[See page 521.]

## Scientific American

### SCIENTIFIC AMERICAN ESTABLISHED 1841

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NEW YORK SATURDAY JUNE 2 th 1910 The left recovered of the production of material article articles as consects of material material. If the production of an other, the article of all only the facts quithern the contribution will recovered place in automatic and articles are considered.

### THE OPEN DOOR OF AVIATION

a dissolving the injunction granted in favor of the Wright brothers against Curtiss, by ludge Hazel and the similar injunction granted by ludge Dand against Paulhan the Chruit Court of Ap penis has simply followed a long established precedent th patent law. As a general rule preliminary injune tions are not countenanced in patent case even by lower tellumals. The reason penet for to seek. Rarely indeed is intringement so charity established that a court is justified in restraining the manufacture and use of an invention is fore the question of patent valid fty is decided. The practice is in every way commend It preliminary injunctions were granted without entering into the question of validity many an honest efendent's business would be crippled until after verse of linguitien his legal rights are clearly defined

The inrightly which results from too great a readings on the part of a lower court to restrain an alloged between is excellently illustrated by this very in on which the Wrights obtained against C and faulhan. As a result of the interlocutory decress and I authan As a result of the interlocutory servess of ludges Hand and Hazz it he Wright brothers have controlled flying in this country for the last six months. I niews he filed a bond with the court, no aviator who used a machine equipped with alterons or wing warping devices operated in conjunction with a vertical rudder could make sell or fit his appa latus in this country. It is far from our intention to ensure the Wright brothers for the attitude which they have taken. They are in every way justified in seeking to uphold their patents and in defending rights which unestablished as they are as yet from a legal point of view are nevertheless the fruit of pains-taking experiments extending over years. Probably the counsel of the Wright brothers themselves were uch astonished by the willingness of Judges Hand and Hazel to grant injunctions against Curtiss and Paulhan as the patent profession at large Curtiss at least was a successful aviator before the Wright brothers decided to cast aside all secree; and to show the world what manner of machine was that of who performances they had darkly hinted Blériot, too, had been pluckly experimenting for some time before the Wrights flew in public. Curius was using hinged wing tips in his earlier machines with which he made public flights antedating the open flights of the Wrights. It is autonishing that the lower court should have failed to find in these facts a sufficient conflict of evidence to deny the granting of an in

With the reversal of the decision of the lower co e Circuit Court of Appeals, the developme aviation in this country is now unhampered Paulban Sommer, Blériot De Lesseps, and the rest of that during company of French aerial pilots, whose ex enliven the press dispatches almost every day, are now at liberty to enter this country and fly with out the fear of finding their hands and their machines tled by a sweeping injunction Moreover, American inventors will have the opportunity of improving exinventors will have the opportunity of improving ex-lating machine provided with wing warping devices, without fear of insurring a fine for contempt of court. Much as we should like to see justice done to the Wrights, we cannot but feel that the reversal of an injunction granted contrary to established precedents will be viewed with astifaction by every seconaut.

THE SCIENTIFIC AMERICAN ARRONAUTICAL TROPHY. PART from the value which will attach to the Sciettific American aeronautical trophy as indicating that its permanent owner has in three different years made the longest flight in the United States, the trophy will possess a strong

historical and sentimental interest as being absolutely the first prize of any kind offered in America for the encouragement of the art of aviation

In this respect the trophy must forever be unique in this respect the trophy must sorewer be unague among the countiess cups and prises which will be offered in increasing numbers during the years to come Cups which are won year by year for certain special events and pease into the permanent owner ship of the winner possess a value and interest which, however great at the time, must necessarily become local and personal as the years go by, but a trophy which carries the distinction of being the first to be offered in that early period of doubt as which marks the inception of a great and difficult art such as that of flight through the air must over poses a value all its own, which will inevitably increase with the lapse of time

In this connection, we wish to draw the attention of nirants for the forthcoming long-distance, cross-coun try flights, for which such generous prizes have been red to the fact that upon their sending a letter of notification to the Aero Club of America flights will receive official recognition and if the dis-tance covered should be greater than the seventy to seventy five miles (official distance now under consid-Mr Curtiss between Allians at intion) flown by Poughkeepsle, that contestant unless his record should be surpassed before the close of the year will be the ntrance fee or expense of any kind attached to such on cutty the sendous of a letter similar to that lo Mr Cuttiss which was published in the Scit 10th Asserts of June 10th 1910 being all that is neces

We wish moreover to take this opportunity secting the rather whitespread impression that the cur of he won three years in succession of fact there is no stipulation of this character itid If a contestant wins the cup three times he



# THE INTERNATIONAL UNION FOR CO-OPERATION IN SOLAR RESEARCH

tific critic were called upon to mention one of the most striking and important features of modern astronomical research it is quite likely that he would refer to the spirit of organized and practical cooperation which is manifested by ob servatories and astronomers. By evolving suitable plans for joint efforts to enable each institution to do plans for four source to ensure seen materials to the work for which by equipment and position it is best suited, and by sasigning through common agreement the particular part to be played in any given campaign, increased efficiency is secured, useless duplit cation is prevented and the entire project under pro cation is prevented and the entire project unifor pros-cution can be advanced symmetrically and rapidly. The photographic charting of the heavens, the obser vation of transits and total solar cellpses, the study of the variation of initiate, and the investigation of the shape and mass of the earth, are a few familiar instances of valuable cooperative effort by astron-

More recently there has been an attempt to secure a similar harmony of effort and collegation in the study of the sun, and in 1904 at the initiative of Prof. George E. Hale, director of the Mount Wilson Solar Observatory of the Carnegie Institution of Washing ton, there was formed among the visiting astronoms at the St. Louis Exposition an International Union f Cooperation in Solar Research. In the following year this Union met at Oxford, and in 1807 at the observathis Union feet at Votoro, and in 1879 at the operation of Mesidon in France. This year, on Asymut 28th, the members of the International Union will assemble at Mount Wilson, California, as the gueste of Prof. Hale and the Solar Observatory of the Carnogle Institution. This meeting should prove unique and memorable, for it may be doubted whether there have ever been assembled so many aminent astronomers in astrophysicists interested in solar studies as the who have accepted the invitation for the Mean Wilso

conference. That such a inchesizate in termity is presistation of the following mirrors of root, like and the shorrowing light direction will be generally admitted, but at the time these distinguished autonomers and physical content of the conten will be able to exemise for themselves this inte institution and its novel and powerful instrum te bi ans of which save rel new chapters in our in of solar phenomens have been written and still other discoveries, especially in the field of stellar evolution seem destined to follow

To most of the visiting scientists who never better have made the pilgrimage from Pasadena up the slopes have made the pligrimage from Passeesa up the slope of Mount Wilson the work of the Solar Observatory is familiar from accounts published in selectific periodi-cals No one is more welcome before Suropean as-tronomical societies than its distinguished director, who wheneve abroad is always called upon to de-scribe its progress. Therefore, it is not surprising that the conceptibility was afforded some fifty that when the opportunity was afforded, some fifty important astronomical observate ies and physical laboratories should decide to cross ies ann physical indovatories anoual decide to cross the Atlantic Ocean and the American continent to see and Larn at first hand of work in which they are inti-mately interested. While it is a source of intense antification to Americans that the Mount Wilson Observatory has become so pre-eminent in the brief space of some six years, yet it must be remembered that solar astronomy and astrophysics are prosecuted with vigor at other institutions and by numerous astronom it is this circumstance that makes of importance the coming meeting of the International Union

The value of solar work may be appreciated when is stated that the dry season at Kodatkanal in Southern India where there is maintained a large ob . Ivalory, corresponds with the rainy seas Wilson when of course the regular daily photograph ing of the sun is out of the question. With proper all angements therefore, it, is possible to obtain a continuous photographic record of solar phenomena. from one station or another on the earth's surface st in visual observation of the sun-spot specti is definitely apportioned among various observers, so that each group receives a portion of the spectrum for thorough study, the results of the various observations being recorded on a common plan Again, so impo in modern solar research has become the use of spi hellograph whereby the sun's surface or limb is photo-graphed in light of a single wave-length, according to certain deficte arrangements, that there is now an important chain of observatories from India across Europe and America to the Pacific Coast, where these instruments are in daily use. To record the amount
of the sun's radiation received at the earth's surface, <sup>10</sup> The sun's radiation received at the darks surrous bolometers and other heat measuring devices are em-ployed at various stations and continuous records are kept. In many cases it is quite obvious that local con-ditions may affect the observations and the records. Accordingly there must be simultaneous observations at a number of stations extending over as long periods. of time as possible. These are being secured with ever greater efficiency by the members of the Inter-national Union for Collegation in Solar Research. Buch cooperative action is not intended to destroy in itiative or originality in any observatory or astron-omer, but rather to encourage it. To-day a large number of observers are engaged actively in solar research, and in no department of astronomy is a greater amount of progress being made. This is all the more striking as it was only a few years ago, to use Dr. E E. Barnard's picturesque expression, that "the sun had almost been relegated to that limbo from which nothing new can ever come

Some interesting communications relating to the general study of the sarth were presented to the In ternational Geodetic Association, which may in Lo-don in September, 1909. The values of the oblateness and the equatorial glanater which have been deduced from the triangulation established by the U. S. Const rrom the trianguation eranimand by the U. S. position and Goodstic Survey agree closely with the values detained from European surveys. Prof. Rotres skilling tied a torrate plakings which registers variations of the force of gravity more rapidly then the pendar una, and with equal accuracy. The experiments made by Dr. Hecker in the Indian Cossa consists the State. by Dr. Hecker in the Indian Geosa onesdern the spin-cratility of incontants. I. a, increased stantity of the crust of the partic between depressions of the spirms, Major Contangham has discovered use belt of more than normal density, bring henceth the Blan-layan, and a second parallel best south, of Blan-layan, and a second parallel best south, of Blan-layan, and a second parallel best south, of the range. Hencher has also stonesded 'fit protect-ing a horisontal pendipular flore disparation, and into a protection pendipular flore department, and attoin in gravity, having a period depart in contant of a lutar day. The variables, sixting twickleft of its phonormical controlled and force this derive, as a or a tune cap. The variance means two chips of the theoretical amplitude and filtred the derit, as a whole, a rigidity comparable with that of greet. The reminisce to determinists in greath; to de man intermediate the control of th

# Scientific American

### ELECTRICITY.

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skey in time of rog. "Wey gravilying is the steady growth in efficiency of the successive submarines which are being tried out of the United States may? The "Balmon," built at the first State States may a surprise and job lunds submerged, established last month a surriane record of 18/6 knois, and a record below the surriane of 18/16 knois. Four corpulors, disablarged when the aliay was at full speed in the submarines of the submarines of the surriane record of the submarines of the surriane s a of bulls-aver

series of pulsayes. B is reported by the Engineering Agency of South Africa, Johannseburg, that an important body of iron see, has been found in Natal within thirty miles of the railway and within seventy five miles of the coast. Limestone has been located in large quantities at a distance of only a mile from the ore Bedy, and coking the coast of the coast. coal has also been discovered in Natal. In view of the fact that the River Tagels, which is suitable for the development of hydro-electric power, runs through the iron ore property, it is likely that the new find will be turned to immediate commercial account.

will be turned to immediate commercial account. The removal of the twelve-pectod, \$0.00 tory Gliender Building at Wall and Nasaun Streets in this dirty is cortainly a record in house-wrecking. The time allowed was 45 days at a price of \$50,000, with a pendity of \$500 for every day exceeding that period. The work will be done within the specified time. The most difficult work has been the removal of the brick backing of the outside stone work. The steel frame was faken down, piece by piece, by Inneking of the a drift pin. The steel work will be available for other construction. other construction.

The system of transmitting train orders in this counone is making rapid strides Statistion filed by the Interstate Commerce Commission show that the telephone is being used for this purpose on one is being used for this purp 295 roads in the United States, on which 25,344 miles road are operated by this method. On ten of the ds telephone dispatching covers 500 piles or more, reads telephone dispatching covers copynies or more, and on fire roads the distance covered exceeds 1,000 miles, this being the case on the Atchison, Topaka & Santa Fé, the Chicago, Burlington & Quincy, the Great Northern, the Illinois Central, and the Pennsvivania Ratiroad.

sylvania Railrond.

The, Burges tunnel under Jersey City Heights, through which for forty years all passenger trains on the Erife Bailrond have been run, will be absandoned on July lat for passenger service, and will be given over whelly to the movement of freight. After that date passenger trains will make use of a great operate four-track cut, upon whole the contractors have been at work for the past three years. The cut, which stands for 4-00 feet through the Heights, is 85 feet. extends for 4,400 reet through the Heights, is 82 reet wide at the bottom, and varies from 45 to 85 feet in depth. It is intersected by four tunnels, where the makerial has been left to place to carry the streets above, but none of these is of greater length than an

at fire test of the reinforced concrete fi of a tall building, the following excellent results were obtained. The floor panels measured 22 feet by 20 feet, center to center of the columns, and they were required center to emter of the columns, and they were required to stand a test load of 500 pounds per square view with a deflection not above three-quarters of an inch. In the test, the deflection most above three-quarters of an inch. In the test, the deflection most child because the load was one-sighth of an inch. With a hot fire beneath the foot, there was an increased deflection of 1½ inches Water from a fire hose was then directed against the bottom of the now heated concrete, when the bottom of the now heated concrete, when the be-parater of an inch deflection. This test, it should be understood, was made of a fleey in the completed intifiance. HAIne.

brilding.
The first Tech, New Harm and Hartford Railroad here received from the Westlandsones Company a new half-pickens substitution for the high-grand substitution and the state of the high-grand situatings services between New York, and Stanthref, which is not deput the company of those strong to neglige the abspect of those strong the new Hart Stanthref, which is not separate to the substitution of the state of th

It has been proposed that the surplus water from the canal locks at Lockport be utilized to generate current which may be employed in lighting the Eric Canal from the Tonawandus to Ablon Surely the adch a system would offer would well repay the cost of installation and mainter

An electric cable has been laid in Oneida Lake connecting Frenchman's Island with the mainland connecting Frenchman's Island with the mainland The distance is a little over a mile. The cable is to conduct current at 5,500 volts to the island, where it will be stopped down to 110 volts to be used for lighting the parvillons and manusement apparatus of the resort. This is said to be the first long-distance, tension submarine cable ever laid

The United States Senate has passed the bill intro The Duncet water season map passed the Di intro-duced by Senator Deper governing wireless teleg-raphy it requires that all wireless stations secure licenses-from the Department of Commerce and Labor The bill sims to prevent interference of messages and the sending of false distress signals and gives the army and navy messages the priority over o

For some years wireless telegraph experiments have been conducted by Dr Frederick H Millener for the been conducted by Dr Frederick H Millener for the Union Pacific Rairroad. It is stated that the road is soon to establish a wireless telegraph system of com-numication with moving trains. Tall towers are to be erected at Sytney and Chayenne, which will have radius of communication. The system should nable in the case of the interruption of wire a wide radius of con be inva service by storms

Hinstrative of the rapid improvement in metal lamp filaments is the recent decision of the Chicago Rail way Company to install tantalum lamps on all new cars and cars that have to be rebuilt. Before arriv-ing at this decision, a series of tests was conducted,



of high potential lines would be greater than the chance of a shock from secondary of 2:0 to 306 volts. For this reason, the recommendation regarding circuits of more than 150 volts was withdrawn

Now that the thunder storm season is here, the Denver City Transays Company is instruction, as supery in the state method of running their cars during a storia. The motormen are ordered to let earn coast as much as possible, so that in case of being struck by lighting, the vital apparatus of the are would not be a liable to injury The motormen are also instructed to note, if possible, the position of the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are is strate by lighting the controller handle when he are in the handle when he are in the controller handle when he are in the handle when he are in the controller handle when he are in the c Denver City Tramway Company is instructing its em-ployes in the safest method of running their cars aby be confined to the controller box. Otherwise it might damage the motors, or it might burn off the trolley wire at the base of the trolley pole. In the latter avent, it would be necessary to have the car pushed back to the barns.

pushed back to the barnal. Pract these was transmitted some days ago from the Biffat Tower by relies to begraphy to all wireless stations and ships fitted with wireless sparsations are stations and ship fitted with wireless sparsation within a radius of 2,500 and 3,000 miles. The time signals are to be continued and will be sent at mindight, and again at two minutes and four minutes after the Taylor receipt of a signal will not enable a skip to currently in a specific or even in longitide, but will be supported to the state of the state of a signal will not enable a skip to virtue at a signaling for time at one has brought up the question of the kind of error, in longitude, to which is these days of security as survivation a ship is liable question of the kind of error, in longitude, to which in these days of secures assignation a ship is liable as error assumulates with the time at sea and as all high carry at least three characteristic, there should not after a shape of 100 days be the least doubt of a ship's longitude—that is within a few seconds—but the simula is few seconds—but the simula is few seconds—but the simulation of the same of time signate scattered over the world by any so Regular that every steamer has the opportunity of springing that every steamer has the opportunity of springing the second of the same fraging of the same shape of the same fraging; the same shape of th

### SCIENCE.

Prof. R. E. Bernard informs us that on June 6th he obtained a very good photograph of Halley's comet. The plate showed the tail drifting off into space, and a new one forming in a different direction

The collection of fresh-water sponges of the U S National Museum is now being critically examined by Dr Nelson Annandale, superintendent of the Indian Museum in Calcutta, who is an accepted authority on this subject. Under the title of "Description of a New Species of Spongilla from China" there has just been issued paper No. 1737 of the Proceedings of the L B National Museum In this publication Dr Annandale describes as new Beongilla (Riratospongilla) streams which appears to be allied to Repongilla aspinosa Potts from which however it differs in its mpact structure and lack of flesh spicules m was found on rocks in the canal in southern Kiang Su, near Shanghai, China The type is in the collection of the U S National Museum

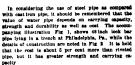
Prof. Megro of the University of Boulogne, has studied the radio-activity of dew The precipitation was made on glass plates exposed in immediate con-tact with the soil for several hours, beginning at about eight o'clock in the evening it is interesting to note that the water vapor was deposited entirely on the surface turned toward the ground while the cosite surface was quite free from any trace of disture. From Negro's experiments it would seem that, as in the case of snow and rain, the activity of dew disappears almost entirely in a very short time, use of mappears almost entirely in a very short time, which may be placed at not much more than half an hour. The maximum radio-activity is detected not immediately after the introduction of the plates into an electro-static apparatus, but some minutes after-wards, in which respect it differs from snow and rain

wards, in which respect it differs from more and rain in one of the Leopolchalu working as here of inflammable gas has been insufing at a depth of 1,500 feet, since August 1,900. The gas contains \$8\$ per cent of hydrogen, 44 per own of methano and 12 of other gases including neon and belium. The belium greatly prependentee over the mean but the two together forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, speller forms about 0.17 pr. cent of the original gas, and the original forms that page 1.18 pr. cent of the sea which speller forms to the degradation of radium satisfaction of the original great stapped. He attributes the existence of the sea which speller forms the radioactive decomposition of as resulting from the radioactive decomposition of a strength of the present 
Mr. Austin Mobart Clark, an accepted authority crinoids, has recently published two papers in the Proceedings of the U S National Museum The first of these papers, No 1740, is "On the Origin of Cer-tain Types of Crinoid Stems" and in which he disses the probable relationship between the column of the crinoid and the central or sur-anal plate of the echinoid, and how widely different types of columns may be reduced logically to a primitive common an-cestor. Among his conclusions from the evidence he presents is that the stems of the recent and most of the fossil crinoids may be derived by supposing them to be the homologue of the central plate of the crinoid echinoid ancestor which has gradually become thickened and elongated and developed fransverse alternat ing fractures which have metamoruhosed into definite articulations. The second paper No 1743 bearing the title "A New Australian Crinoid," is a description of a new species which he calls Compsometra lacertosa and which was obtained at Port Jackson, New South Wales, by Mr J Bracebridge Wilson in the summer

The late Prof Garriott, of the U S Weather Bureau, was working at the time of his recent sudden death on a very promising method of long range forecasting, based on the observation of departures from normal pressure in widely separated regions of the world Telegraphic reports of the pressure at European and Asiatic stations are received every morning in Washington, and were utilised for this purpose of correlative meteorology"—I e, the interrelations of atmospheric phenomena in parts of the world farmente from one another—is now occupying the serious attention of meteorologists in all countries, and ous attention of notescriogists in all countries, and is one of the two mained between it the recent development of the countries and is one of the two mained between the countries and the set of the second countries and the countries of the second countries and the countries of the countries o

# MODERN STEEL LOCK BAR PIPE CONSTRUCTION

BY FRANK C. PERKINS



It may be stated that this capacity depends on fric

It may be stated that this capacity depends on friction, and rivered pipe presents an obstruction at arrivery rivet and every circular and longitudinal saam. It is also claimed that the uniform section of the lock har pipe without any obstruction of any kind from end to end of each length of pipe, matched private and the state of the state o

greater than riveted pipe or is equal to minimize well laid iron pipe

Tests on 30 inch pipe at Lockport, N Y, in 1909, showed a friction loss less than that given by Wat son's Tables for east-iron pipe It is well known that steel pipe is materially stronger than cast iron pipe During a cloudburst in 1903, two 48 inch riveted steel pipe lines carrying 50,000,000 gallons per day for New pipe lines carrying 50,000,000 gallons per day for New-ark, N J, were undermined and int unsupported for four days for over 35 feet, and in addition to the wight of the pipe and the water passing through them (about 15 tons), there were some thirty up-rored trees piled up over the pipe which supported this immense weight and pressure, without damage. It is conceded that cast iron is brittle and treach

rrous at best and though apparently sound one day, may prove defective the next, and break without a

oment's notice
It is of course true that the strength of any ste



Fig. S.—LOCK BAR STEEL PIPE, TAPER JULY.

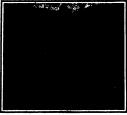


Fig. 1.—LOCK DAR TIPE OF INCIDEN DIAMETER IN

pipe is equal to the stringth of the joints. Sing riveted joints have an efficiency of about 55 per ce double riveted joints about 65 per cent, triple rive counse rivetes points about the per cent, triple rivetes double, butterrap joints about \$0 per cent, and welded joints about \$0, per cent. Leck har joints have are efficiency of 100 per cent, and have greater strength than plates themselves, as all tests result in a failure than plates themselves, as all tests result in a fullers of the plate, which they not be joint. A 48-hack diameter 7/14-inch plate look ber pipe was tested to 1,000 pounds pressure, and the melal of the plate was stretched 4½ inches with neither injury to the lock her joint nor the least leakage along the same. Fur-ther pressure was impossible, because of the blowing out of the riveled reinforcing goods at the inless and,

the gags.
It is maintained that lock bar pips is from 20 to 20
per cent stronger than riveted pips and 19 per cent
stronger than welded pips, and experience has shown
that the natural life of steel pips when properly made
and laid is fully equal to that of cast-from pips.
Without doubt the life of all metal is less than it
to the answer wars are, as nowadays alcotrolysis, sail-

Without doubt the life of all metal is less than it was twenty years ago, as nowadays electrolysis, sulphurous seid, galvanie action and other agents greatly phurous seid, galvanie action and other agents greatly compare the life of pipe laid within the last twenty years and pipe laid prior to that time, because of these constantly increasing corrorive indicances.

According to experiments on the reception of radio-telegraphic signals when transmitting with a spark gap in compressed air, as compared with signals re-ceived when an ordinary spark gap was used, there appears to be no advantage in using compressed air. appears to be no avantage in using compressed air for this purpose. While the delectric strength of the air is enormously increased, so also is the resist-ance to the oscillatory spark, both appearing to in crease in about the same ratio.

# THE WEARING OL

Manganes steel in by no means a new material. But it is a property of the difficulties which manifest themselves in string the difficulties which manifest themselves in string its final facilities which manifest themselves in string that final fine form it seems to have been discovered by Hadfield's Steel Foundry Company, Sheffield, England, some hirter or forty years ago, when seeking a hard and tough substitute for steel when used for cattings it was found that the mere increase of earbon in the was count that the mere increase or dirion in the steel did not have the desired effect. Steel having a carbon content as high as 2 per cent was unsuccess-fully tried. It was known that when the manganese rully tried it was known that ween the mangances content of a steel somewhat exceeded 276 per cent, the sildy would be brittle. What was not known and what the Hadfield Company found out was that if the manganese were increased to a point ranging any where from 7 per cent to 20 per cent a steel might be produced which is remarkably strong and tough be produced which is remarkably strong and tough Now this reversal of a leading property of an alloy by merely increasing the proportion of one of its con stituents is, as R A. Hadfield pointed out, not with In forming alloys of copper and tin the resultant alloys seem to become harder and more the resultant alloys seem to become harver and more brittle as the tim content rises from a low point up to a considerable percentage say 35 per cent, but when more in is present than the soft and tough copper, the alloy becomes softer It was early found, however, that manganese steel was a very refractory metal to machine. The proper

ties of hardness and toughness produced a comtion that was very successful in resisting the cutting tion that was very succession in resisting the obstance edge of the tool And this characteristic is, even to-day, a bar to the application of this metal We have high-speed steels capable of enormous performance blisheaped steels capable of enormous performance when used against the pure arbon steels and east fron. But mangamese steels still hold out. Almost the only practicable think to do is to use the grinder. Now the grinding machine is of late become a strong com-petitor of the ordinary machine is tool. But its develop-ment has hardly been carried for enough to enable it to handle commercially the multiplicity of cutting operations necessary to enable manganess steel to have a general application to all the purposes for which it is highly adapted. Further, it has been found ult to roll

difficult to roll
But so great are the intringic capabilities of this
restardal for certain uses that, in apite of the difficulties of griving it the desired form, it has been perty
rapidly acquiring friends. Consider, for example, the
case of the Borton Elevated Ralivay Company. This
corporation operates its transportation, system on a





wing extraordinary wearing qualities of manganese size rails.



This carre has the small radius of \$5 feet. PARE STREET CURVE OF THE BOSTON SCHWATED BALLWAY OF WHICH STREETS WHAR OF BASEA SOUTHERS.

# NGANESE STEEL

others have radii between 100 and 150 feet. constra have read between 100 and 100 rect. Soon stars operation began, those in charge became im Presed with the fact that an enormous destruction of rails was taking place on the curves. This has been ascribed largely to the sharpness of the curves, and to the combination of grades and curves. It was been aserbled largely to the sharpness of the curves, and to the conjunction of grades and curves. It was on the curve of the Park Street south-bounds track to the conjunction of the park Street south-bounds track of the park Street south-bounds track the state of the park Street south-bounds track that the state of the park Street south-bounds track and sharp south-bounds track and ship-action Beassmar rail were all tried The last was the only one which had even a moderate life—10% months. Nichol stead was tried on a sea of the state of the sta had to be taken out because of its failure to equal the companion. The center of the head had been were down over \$\%\$ lacks while the corresponding position of the property of the companion of the center of the

# THE CONTAGIOUS DISEASES OF METALS

THE RESEARCHES OF PROP. ERNEST COHEN

It has been known for some time, and probably one in antiquity, that makes are subject to diseased considerate. Prof. Erroset Cohem's researches have thrown strained, moreover, the contagions nature of such demonstrated, moreover, the contagions nature of such date lesses, that is to any, a piece of diseased metal has the power of infecting, by a not of catalytic action, a piece of sound metal with which it is in contained.

The second

THE PEST In 1851 Erdmann, in a communication made to the Reyal Society of Sciences at Leipsic, called attention to a peculiar structural modification of tin which he had observed in some old organ pipes. He attributed the change to the vibrations to which the metal had

the change to the vibrations to which the metal ball been subjected. In 1889 Fritzsche of St. Petersche of St. Described observations of similar phonomena, and agginged the opinion that the alteration in the nature of the tim was due to the action of sewere cold to which such in had been exposed, and verifical to correctness of this theory experimentally Other in versigators turned their statemin to this subject, but the true nature of the modification and the exact con ditions governing its appearance and development were not fully understood until they were determined by Prof. Obsets. by Prof. Cohen.

by Frof. Coban. The disease studied by Erdmann and Fritzsche is designated by Frof Coban as tin past. The metal thus affected weells in spots, forming ward like bilaters, from which small drops issue and hang supposed in very much the same numer that drops of quicknives will adhere to polished copper coins in the further propries of the disease, the bilaters between the contract of the disease larger and the metallic

gioss disappears more and more The interior of the mass is affected last, as can be shown by sawing through the metal whose sawing through the metal whose surface has become quite dull When the entire mass has been transformed, it crumbles read-ily, and consists partly of a granular powder similar to granular powder similar to sand, and partly of more or less consistent fibrous lumps of all sises up to that of a fist. When a place of tin is cooled artificialthe modification appears first ed spots, from which it at isolated spots, from which i spreads in wart-like blisters and later forms a columnar struc-

Tin thus modified by a of cold is distinctly gray,

Action to town a metal produces a remarkable change. Even by merely covering it with hot water, the dark gray color is the control of the con

it was before heating If modified, tin is heated to fusion, an appreciable proportion will remain in the oxidized state The moditon portion will upon solidin assume the appearance of ordinary tin, and if cooled to a low temperature, it can be transformed



Brass kettle correded by the wrought metal

again into the gray modification. Ordinary tin has a specific gravity of 728, but gray tin is considerably

lighter, having a gravity of only 5 75 Prof Cohen directed his attention at first to deter-mining the temperature at which ordinary tin is

Antique coffee pet perforated by the tin Results of inoculation with wrought

transformed into the gray modification, the results obtained by former investigators differing widely, some having found 35 deg (Centigrade) as the critical point, others 100 deg., etc Fritzskho's experiments indicating that the transformation was enanticle, it was to be exper tropic or re would be a definite temperature at which the trans-

formation might proceed in either direction Prof Cohen employed two independent methods for determining this critical temperature One, an elec-trical method, consisted in bringing two separate trical method, consisted in bringing two separate bodies of gray thin fao a vessel containing a 10 per cent solution of chlorostannate of ammonium. The two bodies of this are connected with an apparatus permitting the experimenter to observe and measure any electromotive force artising in the cell. As long as both bedies are of the same temperature, there is no selectromotive force. But if now of the the bodies is given the temperature of boiling water, and the agreement of the contraction of the contraction of the force of the contraction of the contraction of the contraction of the force of the contraction of the contraction of the contraction of the force of the contraction of the contraction of the contraction of the force of the contraction of the contraction of the contraction of the force of the contraction of the contraction of the contraction of the force of the contraction of the con formed into ordinary white tin, while the cooled body remains gray The electromotive force manifested remains gray The electrometive force manufactual under these conditions was measured at different tem under these conditions was measured at different tem peratures At about 20 deg C the electromotive force was equal to zero, indicating that the critical tem perature is in the neighborhood of 20 deg. C. Prof. Cohen also found that the presence of the chlorostannate of ammonium solution accelerated the transfor-mation considerably, in both directions

The other method was a volumetric one based on the fact, stated above, that the two forms of tin have different specific gravity. The apparatus employed is very similar to an ordinary thermometer, except that the capillary tube is open at the top. The lower part of the bulb is filled with gray tin, the upper part and a portion of the capillary tube with a liquid inert relatively to tin, such as petroleum. The apprratus is heated to a temperature (say 25 deg C) a few degrees above the probable critical point, so that a

portion of the gray tin is trans formed into the white variety Then the apparatus is kept for some time at a constant tem-perature of say 21 deg C and the perature of say 21 deg C and the behavior of the petroleum col-mm is observed by means of the scale. After a few minutes it will be found to have fallen a few millimeters thus indicating that 21 deg C is still above the critical temperature, for as long as the formation of white tin continues, the mass of tin contracts in volume, owing to the greator specific gravity of w tin The temperature being then kept constant for a time may at 15 deg C, observation will above a rise of the petroleum column, thus indicating that the volume of the tin has increased by the formation of the specifically lighter gray tin, so that the crit ical point must be above 15 de-C. By successive operations a gradual approach to the critical

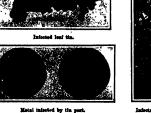
point is obtained by working at temperatures alter-nately above and below said point, and when the limits have been restricted sufficiently, interpolation is limits have been restricted sufficiently, interpolation is resorted to. This method also showed that the critical temperature must be in the neighborhood of 20 deg C and careful determination proved it to be almost early 18 deg Centigrade (about 65 deg Fabrenbeit)

Since all tin utensits employed by us are made of the white modification, it follows that they are gen-

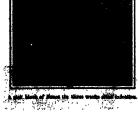




CONTRACTOR MINIMAGES OF MINTALE. .



Infected sheet tin from Retenburg (ity Hall.



erally in an unstable compan and Hable to be transformed partly into the gray variety, except on days when the temperature exceeds 85 deg Pahrenbelt.

The second method described above was also utilized to assertion at

riain at what temperature the trans tion of white tin into gray tin proceeds with the greatest rapidity and this was found to be the case at about 48 deg. Centigrade below zero (about 54 deg F

An interesting discovery was that the trans tion is hastened considerably by the presence of a few particles or "germs" of gray tin it follows that it an "infected" piece or object of white tin is left to itself at temperatures below 65 deg. Fahrenheit, the transformation will proceed constantly and with in-creasing rapidity, for each particle of gray tip, as creasing rapidity, for each particle of gray the, as soon as it is formed, becomes a new germ accelerat-ing the transformation. Prof Cohen has given this phenomenon the name of the pert in view of the germ like or infectious aution of the gray its particles, and also in view of the fact that the time so stacked is practically ruined, since the restoration of the ly moiting in attended with great losses owing to the string cutdation which takes piece during the besting, on account of the finely divided condition of the

The formation of blisters during the conversion of the tin into the gray variety is a natural consequence of the increase of volume, since gray tin is about 25 per cont lighter than white tin

Tin articles which have been exposed to low tem peratures for a long time, may several centuries, would naturally be expected to exhibit a maximum of deterioration This is indeed the case, as has been deterioration This is indeed the case, as has been proved by the condition of antique tin vanes, media, and other objects dug up in our times. In museums, too, the deterioration of tin articles has been observed frequently, but the cause was not understood and no remedy was known. In the light of Prof. and no remedy was known in the light of Pref Cober's discoverie, the remedy is simple we have only to see to it that the articles are never exposed to a temperature below 18 dey Contigrade (65 deg Phiroshett) Investigation has shown that in man, cases where excessive and apparently unaccountable deterioration of its naticles had been reported, that articles had been exposed to low temperatures during ,

WBOUGHT METAL DISKARS Strange phenomena were observed by R. von Hamb-linger at the tinned solder seams of an air-compressor made of tinned sheet iron. The solder had melted way in spots, as it were, and had assumed a crystalline structure, the tin covering of the sheet iron had dar and dull on its entire surface. It Decomo granular and dull on its entire surrace. It was unlikely that the receive the compressor had seldom, if ever, been exposed to temperatures below its deg Contigrade R. von Hass-linger nevertained that pieces of this diseased the would infect sound tin, and that this was apparently independent of the temperature thus indicating again that the form of tin pest previously recognised was cause of this newly observed tran not the cause of this newly observed transformation?
The tin became crystalised in minute wartlike
bodies and the dull portion would spread with the
locate of growth decreased with the increasing
distance from the center of infection. R. von Hassillager thought that the phasomenon was due to crystallisation, and continued his experiment, showing
that the modified in had a lower melting point than
the original metal, about 256 deg Contigrade instead
to 182 deg P. a last found that in full infected on one side would become modified on both sides Other experiments made by him, however, seemed to indicate that the crystallization theory was erroneous, and he published the result of his observations with an acknowledgment that he was unable to account for them. An untimely death having prevented von Hasslinger from concluding his investigations, his teacher. Guido Goldschi niedt, of Prague, drew P Cohen's attention to the unexplained phenomena and

aggested that he continue the research Prof Cohen repeated von Hasslinger's experim and verified them in many ways. He ascertained that the small lead contents of the tin would in no way be held responsible for the result. He first believed that the phenomena might be explained by the forms tion of the rhombic modification of tin which is un stable at temperatures below 161 deg C, having a tenwence to resume the normal tetragonal form. If this hypothesis had been correct, the phenomena should have been absent at temperatures of 181 deg. C. and above Experiments, however, showed that the transformation into the new dull non-degree. formation into the new dull powdery form of tin took place at 184 deg. C even more rapidly than at lower temperatures. This hypothesis therefore had to be

abandoner
Prof Cobes then turned to another explanation,
based on two well-known facts First, that a metal
whight has been subjected to a tensile or to a congression strain (such metal being designated as
"wrought mpta" by Prof. Cohen) has an electricitytic
speciate presente higher than the same metal if it

has not been subjected to meckanical forces; "search, that several metals, tin among others, have the prep-erty of recrystallisation, that is, of exhibiting a growth of their individual crystal grains, more particularly at high temperatures

stendarly at high temperatures. It is well known that two specimens of "wrought metal" are seldem absolutely identical in an election absolutely identical in an election price sens, and "wrought metal" in an unstable condition, having a tendency to return to the condition of "unavrought metal" "Ihi standency, slight at ordinary temperatures, ought theoretically to be strengthened by an increase of temperature, within certain limits, and it is also to be expected that certain limits, and it is also to be expected that certain limits, and it is also to be expected that the transformation. These theoretical deductions have been fully confirmed by experiments.

Perf Cohea Cleaned some plates of timed sheet iron

Prof Cohen cleaned some pistes of tinned sheet iron with hydrochloric acid and polamium chlorate. This produces, in a short time, the well-known metallic moiré effect. The surface is then washed carefully and rubbed with a fine handkerchief. The plate an and rispect with a fine handkerchief. The plate so prepared is pressed in a vise against a highly polished plate of tinned sheet iron, and upon heating to 184 deg. C the polished plate becomes infected and ac-quires the property of infecting others if however-both plates are highly polished, no modification will Another experiment consisted in applying to a moiré plate such as mentioned above, some powdered interted tin foil and on top of this, a polished plate of tinned sheet from Heating to 100 deg. C caused the polished plate to be affected immediately, while the

polished plate to be affected immediately, while the moire plate remained undered even after M hours, more plate remained undered even after M hours, and the second of th



particular conditions. Similar effects of corre were observed on home door handles, and Fred. Coher also thinks that "wrought metal disease" accounts for the peculiar deterioration of the rolled lead roof of a sulfurio acid faciory The temperature of from 40 des. C to 60 deg C., to which the roof had been exp was very favorable to the recrystallimation proof

### The Current Supples

The opening article of the current Suprement. No. 1798, describes a saw-dust compressing machine.—Recent describes no American locomotives are discussed—Hr Leon A Hacketts excellent article on the Processes in Cotton Spinning is concluded.—Prof. J. A. Ewing reviews the work of Lord Kelvin in telegraphy and navigation—In an excellent article entitled 'Oil Field Phenomena," Mr A. Booby Thompon give a brief review of the nucle of occurrence of petroleum and the means adopted for its search and recovery—Mr R. T. Hewlett writes on soured milk from the Metchnikoff standpoint.—Plant anesthetics is explained by B Leonard Bastin

Riverse y.

It is reported in the Electrician that the Chicago
Electrical Railway Commission is considering five
plans to solve the problem of "through router" for
certact trains in that city Thirty-slight plans were
submitted to the Commission, and five of these were
submitted to the Commission, and five of these were
submitted to the Commission, feals that
reported has been made in narrowing dewn the work.
It is pointed out that each of the four electrical railway commassies is operating under a separate ordiway companies is operating under a separate of e granted by the city, and that the interest nance granted by the city, and that the inter-clating of the sewred lines is caused by the spind us of the "down-lows" Union loop. The companies are double ful whether they can afferd to hash passenging for a greater distance than about six miles for the cents, but there is appearantly a desire on the past of companies concerned to regad, a pointing of the quantum.

# Cortes on Chief.

A side, in the property of the control of the contr

I have been retained as counsel for this increment if your valuable paper will publish this letter, I true that every wireless enthusiast throughout the Units States will send his name to me at my office, Hill Building, Washington, D. C.

GRO. HIRAM MARR.

### STREETANGER APR II

To the Editor of the Schemeric American:

Relative to your suggestion, regarding the hear word proposed by Mr. Wood, namely, "mechanipulate," it seems to me rather complicated, and I would suggest that the more homely term, machining or machined, would be far mor sald be far more appropriate in the app

Waterbury, Coan.
[The term mechaniquiate does not rafer to the machining" but to the mechanical hadding, 1 c., moving, placing, centering, etc., of a piece of work,

GIVING THE APPRARANCE OF RELIEF TO PICTURES.

To the Editor of the SCHREUPS AMBRICAN'
A simple method of giving the appearance of relief to pictures can be seen by the experience or return to pictures can be seen by the experience that it a shoet of glass with minute cylindrical fluting on a since to glass with minute cylindrical fluting on a since to glass with minute cylindrical fluting on a flutes vertical, be viewed through, the dispersing light gives the picture a stereographic effect of

light gerte solidity.

The utility of a minutaly fluted dispersing picture cover glass screen therefore can be shown, which is dispersing the strength of the critisariosis. cover glass screen therefore can be shown, which is caused by the semicircle dispersion by the cylindrical flutes of the light that is reflected by the photogr The determining factors are the minuteness of the fluting and the position and the thinness of the view

The dispersion of the light by the refraction through these adjoining flutes of this stereoscopic screen pre-lexis to each eye a different appropriate view of the pickees, which produces the impression of solidity and depth. London, Rheland

Scientific American Prince for Inventors. The SCIENTIFIC AMERICAN offers \$100 in three pri to be awarded to the inventor who gives the best account of how he conceived his invention, how he developed it in actual practice, and how he succeeded in selling it. This sum of \$100 to be distributed as follows \$50 to the best account, \$25 to the second

follows \$80 to the best account, \$85 to the second best account, \$10 to the third best account. There is no limitation as to subject matter of the invention. In other words, the invention may be a household utensil, a game, a piece of electrical appearing, an improvement in railway construction, a metalungical process, etc. The following conditions, however, must be observed.

1 The invention must be patented.
2. The inventor must have actually sold his patent, and the invention must have been commercially in-

treduced.

3 The account of the inventor's nuncess must not be longer than 860 words.

4 The completion, letter, or article must be type-written on one side of the paper only

5 The inventor must sign his offering with a pseudoury, and inclose it in a sealed survices, most which the periodorym is written. A second sealed exhibits the periodorym under which the offering or the outside the periodorym under which the offering is substitled, and the docum under which the offering of the outside of Contestants sum deficies their, offerings for inventors' Price Editor, Spranging' Argington, 357 States.

tord Price Belder, Bonnstager Angiantan, 307 September, New York origin.

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l'emittion.

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je fig. this disease, which is introduced, in impres
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state of the state will almost certainly ward off this diseas before its introduction was fatal in more the shifths of the cases; that practically all health de wed to provide this antitoxin, when asked for it by one; that in the event of any wound, imp sweepsmer; takt in the event of any wound, immediate mediate surgery is imperative, and that if any smell wround be examined under the microscope for the signestion, the latter's absence after sweeps are small stated. should greatly allay fear of the disease de-

Baying several years past humans citizens, anxious in Several these deaths and sufferings among our young people, have striven to interest public opinion in the substitution of celebrations of the great namak holiday every whit as patriotic, while at the merime much safer and saner, and at least as conmanus aumo muon sarer and saner, and at least as con-volute to pleasure and patriotism as those that have hitherto obtained, and year by year the success of binds, endeavors has been progressive. I would here theigh what has been done in these premises during hast twelvemonth

Re has twelvemonth Light year independence Day fell on Sunday—the shife reach, no doubt, why the number of tetanas shaul, which had therestoftee been steadily decreasing, despited in 1808 those of the preceding year. The sensing holdesty rails on Montay, no that the festivities are liraby again to be spread over three days. There seems moreover to have been j'esized atthority regarding the use of fireworks, especialty in Illinois, Manachausta, New Jarray, New Tork, and Pennaytve-Massachusetts, New Jersey, New York, and Pennsyvis-nia; this relaxation regarding especially the use-or blank cartridges resulted in an increase or todello-cases. Newtheless, last year there was gratifying evidence of an increased public sentiment in favor of more rational celebrations. Two cities, Washington and Cirveland, Joined those which had already passed prohibitory ordinances, and Chicago enforced a re-strictive ordinance, with the result that no casualties were reported from Washington, only four slight in juries for Cleveland, and less than half the usual number of accidents—with no deaths—for Chicago, although this latter city had 19 dashts 1202-1202. ber of accidents—with no desiths—for Chicago, sit-though this latter city had I death: in 1968 and 16 in 1967. Prohibitive ordinances have been more of fective than restrictive ordinances, the latter in turn are much better than the de-nothing policy As I have infuned, year by year efforts have been progressively making to substitute sensible anus-ments and enthesians for the explority collections.

ments and anthusianum for the applicative celebrations that her resulted in 74 tetanum destile among that her resulted in 74 tetanum destile among verbildren in server years. Springfield, Mass., while shating not a join-indeed, rather enhancing—springfield of genuine patriotism, has provided parades, flosis of genuine patriotism, has provided parades, flosis of all, an annual chorus drilled by aktiled leaders in the mass singing of national size and popular songs. How worthy of semisation by other communities! How worthy of semisation is not seen to be a semisation of the American Medical Association. As the server years past demonstrated by satisfation

gratifying to all but the "butteen interests" involved:
The Journal of the American Medical Association. As for serve years peat demonstrated by statistical the appalling number and character of the casualties from our wounds colorisations. As I have statistically a statistical the appalling number and character of the casualties reasonable the convention of the colorisations. As I have statistically the convention of the colorisation and a linear statistical period of the colorisation of viriles the colorisation of the

All classes of publications are taking up the propa-panda begun by the American Medical Association; www.papers and magazines are utilizing the statistics risich its Journal has submitted. One magazine magines the results of a vote by Congress to sacri-ce each year one unknown boy as a national Fourth See each year one tinanown nor see a national rousing of-of-July offering—the newspaper extres announcing the grotesque and extraordinary action, editorial denun-ciations of our law-makers, the public agitation and supreme indignation, petitions to Congress and the President, the tunuit that would inevitably attend the rreament, use tumut task would institute attend the execution of such an act of madness. Yet we have supinally been allowing, year after year, with the abso-lute certainty of the result before us, the slaughter of hundreds and the mutilation of thousands of our children, with the natural consequence in suffering, torture of mind, and desolation in many households

Our people are indeed well on the way to grasping Our people are inneed wall on the way to grasping the logic of these presentments. Everywhere individuals, olvio societies, and kindred organisations are at work, measures are on for the formation of a national committee to promote a "safe and sane Fourth", tunate committee to promote a "and as asse Fourna",
municipal authorities are acting understandingly, to
legislation bitherto enacted, more has been or will be
added this year. The action of the Medical Society
of the Siste of Pennsylvania is especially notaworthy
y reason of its comprehensive character. Its Com
mittee on Independence Day Fatalities recommends. Legal control of the importation, manufacture, and sale of explosives used only for purposes of celebra tion; municipal control of the use of firearms and works during the Fourth-of July season, munici pal participation in substitution methods, the organisation of societies for both control and substitution purposes, the most complete possible systematic use



making the heatest, he attained in difficient of 900 feet in a minutes. It took him a half hour to reach the greatest height. It took him a half hour to reach the greatest height. It is descended in circles the same as when he ascended, and when within a hundred feet of the ground, he shut off the motor and gilded to earth he following only Brookine continued his exhibition flights and gave another demonstration of his skill as an aviator by fright for nearly a hour in a skill wind After doing many fancy maneuvers he made a gifde and landed shurest at the skarting point. One of the other Wright machines had trouble with its motor and landed shurest at the skarting point. One of the other Wright machines had trouble with its motor and was unable to make more than a half circuit of the course. There was very little firing this day on account of the wind.

The third day of the meet Brookins again attempted to make an altitude record, but only succeeded in reaching a height of a little over 1.700 feet. After the usual performance of the five Wright hipknes, Orville Wright made a flight in which be performed numerous and daring evolutions over the trees in the surrounding fields. His machine few very steadily and made sharp turns, but did into show the speed that Hamilton subfibited in his Ourties biplane at

is the fourth day of the meet aviator Brookins well sigh, chaffed Grville Wright in the fancy maneuvers he embested and in the sharp turns he made. He creat-

ed a new world's record for turning by making two turns in 6 2-5 and 6 1-5 seconds respectively. The circle he described was less than 150 feet in diameter, The best previous record of this character is said to have been made by one of the Wrights recently at have been made by one of the Wrights recently at Dayton Brookins again attempted to break this atti-tude record, but only succeeded in reaching 3500 feet after a 45-minute ascent. He required only 10 minutes to descend from this beight. Two and three acro-planes were frequently fring together during the after-mond, and at one time the motor in avitator Homey's Wright machine suddenly stopped when he was a bright of 300 feet. He gitted down in a straight line and landed in a field out in a distance away and landed in a field quite a distance away

On the fifth day, Brookins again attempted, and this

time successfully, to break his sittitude record After soaring in wide circles for 40 minutes, he reached a height of 4,503 feet. The machine was but a speck in the sky and on account of the bare and the lateness of the hour, it was sometimes momentarily lost to view After apparently hovering for several minutes, he be gan a slow descent in wide circles. Brookins circled five miles to the east of the motor speedway and five miles to the east of the motor speedway and gradually closed in upon it. He had difficulty in seeing the track because of the gathering darkness. The motor stopped when he was only half way down and he was obliged to make a long gifde. He finally leaded he was obliged to make a long gifde. He finally leaded in a farmer's yard a couple of miles from his starting point. The flight had leated an hour and a half, and the starting that the starting that the starting that the tarty and offer he was the starting that the starting has yet been made The Indianapolis aviation meet did not draw the

crowds anticipated. This was doubtless due to the fact that only one make of aeroplane was used. In order to have a good sporting event, various typ

# ed: Information About Dishonest Patent

nated: Information About Dishonest Patent Nehrmes.

BECKETIFIC AUTRICAT HAS Always made a prac-of exposing the suares and devices of the patent moter, as well as the fraudulent patent attorney
cough the subject is by no means new to the read
of the Scientific American, it is one of which all

word with the makes of the Surveyur Assert would like for exceeding the subject in by non-assertance to the read of the Surveyur Assert would like for review from the product of the Surveyur Assert would like for review from the grant of the subject of the surveyur Assert from the grant of the subject of the surveyur Assert from the grant of the subject of the surveyur and about not only be of interest in them the surveyur and then the surveyur and then continued in studies who have surveyur and the continued in studies about an activity distinction The first of these, for Truman thing the half hour to reach the greatest height, he attained an difficult of Tool feet in Timinates. It took him a half hour to reach the greatest height, he attained an difficult of Tool feet in Timinates. It took him a half hour to reach the greatest height, he attained an difficult of Tool feet in Timinates. It took him a half hour to reach the greatest height, he attained an difficult of Tool feet in Timinates. It took him a half hour to reach the greatest height, he attained in the substitute of the surveyur in Columbia, and more recently has been a student under Book and the surveyur and the columbia. sand then continued his studies abread at the univer-filties in Leipic and Hom. If then taught compara-tive philology at the University of Missouri in Col-umbla, and more recently has been a student under Boas at Columbia University in New York city. He has published various papers, in his specialty, and has in press a revision of Jones "Crummar of the FOX Language." D Michelson will undertake to determine the linguistic interrelationship of the greater termine the linguistic interrelationship of the greater groups of the Algonquian languages. For this pur pose be will visit during the summer the Blackfeet reservation and the Northern Cheyenne reservation in Montana, then the Windriver in Wyoming, and omoni re ervation in Wisconsin, and the Mi-Menomoni reservation in Wisconsin, and the almost reservations in Quebec and New Bruuswick The other of these new appointees is Mr Paul Radie, who has presexuted advanced studies in antiropology at the universities in Berlin and Munich, and during the last four years has been a student under David and Farrand at Colombia University in New York city, from which institution he is soon to receive his doctorate. Mr Radin has taught at the College or the doctorate. Mr Reddin has taught at the College or the City of New Torit, but has decided to relinquish teach ing in order to follow ethnological studies as a life-work, and to him the Bursun has assigned special investigations among the Winnebago Indians of Nobraska. Mr Reddin is the author of numerous pa pers which have appeared in the Zeitzechrift für Rüb-nologis, the Journal of American Folk lore, and the Proceedings of the Royal Asthropological Institute of Great Britakis and Ireland.

# THE GERMAN DREADNOUGHT INA

THE FIRST OF THE GERMAN FLEET OF DREADNOUGHTS TO BE COMPLETED

In view of the great secrecy which has attended the construction of the 'Nameau," the type ship of the feet of German dreadnoughts some surprise was expressed upon the first public view of the ship, that expressed upon the first public view of the sing, man-able possessed, as a freadmought, no features of murked novelty. To the people of the United States, there is something familiar about the arrangement of hor main battery, with its armament of heavy guns carried in six turrets, one forward and one aft of the center line, and four arranged amidships quad rilaterally Their thoughts will be carried back some rilaterally Their thoughts will be carried sake some twenty years to the time when the plans of our first battleships 'Oregon," 'Massachusetts," and "indians," were made public The distinctive feature in these vessels was the heavy battery which they carried and vessels was the heavy battery which they carried and the novel plan upon which it was disposed, the pairs of 1 isn't guns being carried in turvels forward and at and the pairs of 5-lost guns being mounted in four inverse two on either beam, arranged at the four corners of the superstructure This, it will be observed is practically the plan followed in the the ships of our own navy, the guns are all mounted upon the longitudinal axis of the ship, and conse-quently the whole power of the 18-inch battery can be brought to bear on the broadside throughout a wide are of training.

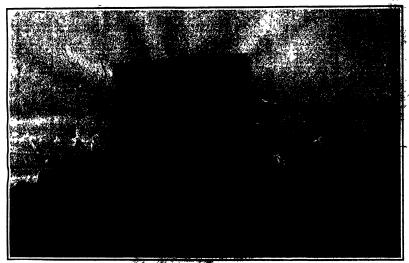
In particulation of their adoption of the quadrilaters' system of securities, the Germans amonance their covered of securities, the Germans amonance their covered to the securities of the fature target will be more fighting in the modes or qua terring position than the advocates of the all-centerline system of monating believe, and they emphasize the test that the "Nassau" can not only concentrate all heavy mus in the sedem position, but that she could deliver this heavy fire, should the citizennies of an engagement demand it, both forward and astern at the same time. Furthermore, there is a certain advocategi in the fact that two gues and four truer's are held in reserve on the less side and are greatly protected by the survive high rar in engagement on what might be called the weather fighting sides of the skip. In justification of their adoption of the quadrilaters'

turret, not eaty would the broadside fire "Naw.u" be iner-said from \$ to 12 heavy we the out-on fire you'dle be trengthessed by no of two more gum, risking it from a consentra-dat to one of eight gum. This is the packed in the new Aryentine crutiers, the most

in the new Argentine cruisers, the most perfections, the new their construction, which also to five eight sens absed or eight assurers on the review on either broadside.

However, in estimating the marits of west sign, we must be carried to been in midd they of displacement, which in the "Nassur' eight, we must Bigues of £500 tons; and, \$\frac{1}{2}\$ to member that our intest dreadmonths have resulted to the control of the "Nassau," have turned out a decidedly

The following dimensions, which have been could through the courtesy of the German Navy Department by the Langth, 453 feet, being may be taken as correct. Length, 453 feet, being



Length, 66 for. Beam, 65 for. Brazi, 505 for. Deplacement, 18 for. Remail cost of 1977, 69 ton. Person 18 for. Beam, 65 for. Brazil, 18 for. Armanous i Twire 11 for. Person 18 for. Brazil for the 18 for. Remail cost of 1977, 69 ton. Armanous i Twire 11 for. Remail cost of 1978 for 18 for

'Nassau" Incidentally, it may be mentioned that the Japanese bave adopted the same arrangement in the first dreadnoughts built for their navy

Obviously, the principal disadvantage of the system is that the ship, although she mounts twelve heavy guns, can bring only eight of them to bear upon either broadside, at least four guns being masked by the superstructure or by the other turrets while she is fighting a broadside engagement with the anemy In Should the weather guns be disabled, it would be possible for the fleet to make a complete turn of 180 degrees, and bring four big guns, with their gun crews entirely fresh, into the fight.

crews entirely read, into the again.

To these arguments it will be answered that, by
moving one of the four amidahly turrets forward and
placing it at a sufficient height to fire above 'the
foremest turret, and removing another of the turrets
att and giving it a similar relation to the aftermost

feet, draft, 28½ feet; displacement, 18,500 tens; normal coal supply, 950 tens. The "Nassau" is driven by triple eagines, and on her trials considerably exny tripie engines, and on her trials considerably ex-ceeded her contract speed of 18 livots and may be set down as a 30-knot vessel. The armanest consists of twire 11-knot, truyine 5-knot, and gittees 4\_65not, guas. Bits is "probated by elegen (notice of Epings guas. Bits is "probated by elegen (notice of Epings), and twitve inches do the goganing-towice.

## An English Judicial Opinion of Complex Patents,

an Kugitha Justical Opinion of Compiler Patentia. The complexity of patent appellication phrasopy, and particularly the bewildering character of the subject of a decision of an American patent, were recently made the subject of a decision of the House of Lords. The case which have member of the House were called upon the tide, was that of Linotype and Machinery Limited va. Hopkins. We presume that the specification, but the hopkins were presented by the patential of the Lords was after the condemnation of the Lords, was after the condemnation of the Lords, was obtained by the American specification field in Engined without any change. The tollowing is an extract from the decision, the unanimous judgment of the first members of the House of Lords. The appelliant (i. e., the patentses) has filed a specification which resembles a treatise in its length;

it contains no less than sixty claims; there is infinite it contains no less than sixty claims; there is infinite redundancy and repetition and constant reference to illustrations which are not very easy fooliow. Alternative she have been been been from the paster it is a document which aped the most prolonged and posterating study in order than aproxon. Who wishes no work out problems of inquestion in this class of industry, my know where they stand and how they may be free from the danger of indusing the free from the danger of industry.

remove passence.
"The point whether this patent is good of sort does
not arise in this case, but I think by in six disty
acts applicably that those who fire, and severe specific cations must take the risk of having the whole there
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and claims to as to pusple a stellant, and tell drightless that the pusple and the claim of the

Urantum in familia demandation in carbo residente de la carbo del la carbo de 
# milition's Round-Trip Aeroplane Flight from New York to Philadelphia

A REMARKABLE CROSS-COUNTRY FLIGHT

case s-few days after Glenn H. Curtles's flight from section in the Tork, aviator Charles E. Hamilton section more daring and thrilling flight from New man and the Palladelphia. This second flight was planned in the New York Times and the Philadelphia Public ladeshy and aviator Hamilton, carrying a latter from Mayor Caynor of New York to Governor Stuart of Pennsylvania, axecuted the flight on schedule time During a considerable part of the trip he raced a special train which at times found difficulty in keeping up with him.

The start was made from Governor's Island at ?

A M od Monday, June 18th The actual start took place only after Hamilton had broken a propeller in attempting to start the first time, due to the blade striking a stick that lay upon the ground As aron as he had substituted a new propeller—the very one used (Continued on page 527.)



Regulies, Sping above the Property and Railroad tracks in pursuit of the special train-NAMES OF SOURCESS ARROYAND PLONEY FROM HOW YORK TO PRILADRIPHIA.

# New Filtered Water Supply for the City of

HOW THE ALLEGHENY RIVER WATER IS PURIFIED AND DELIVERED INTO THE CITY HAN

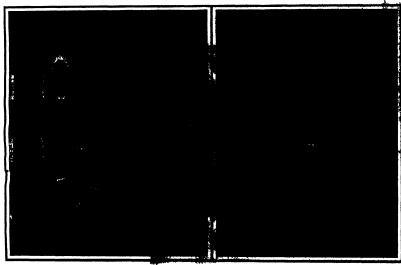
There has recently been completed for the city of There has recently been completed for the city of Greate Pittsburg an ambittous sheme of 1 ure water supply which represents the very latest developments in work of this character fee site for the filtration plant is on the north bank of the Allegheny River about seven miles above the point water it joins the Monogashels to form it. Othio The new plant is located a short distance at wa and on the opposite of of the river to the Brilliant I unping Station which formerly tak water fr m the river direct. The plant extends along the river front for \$700 feet and cov

ers som 225 sares
At the unstream coner of the site low lift pumps located in what is known as the Ross Point Pumping Station raise the raw mater to a cutral receiving or a functiatin lastu of 20 000 000 gallons capacity On each side of this rec twing basin is a larger sedi mentation tasin and the three have a combined capac it) of 130 000 000 gallons from the central reciving basen water flows to the rest of the plant by gravity

water is presented by the property of the present o tation basin Above this chamber is built the admin

voir, which has a pagentir of 50,000,000 later in 16111 of juintle observative with a root, the intelle plaint earth of 175 or inches in diameter, 1714, field high, appear to consist "These article up belief largest of this type that have eiter the property of the plaint of the type that have eiter to perfect the property of the type that have eiter to perfect the type that have eiter the type that have eiter to perfect the type that have eiter to be the type that the type the type that the type the type that the type that the type the type that the type that the type that the type the type that the type that the type the ty

the Brilliant Pumping Station Originally, ing station had a daily especity of about gallons the plant consisting of two 10 of Holly engines and two 18 000 Holly engines and two 16 000,000, and for guilon Allie-Chainers vertical excessorable ing engines At the time of the belld filtration plant two additional 15,000,000% and Allie-Chainers pumping oberines ways of grounds of the filtration plant witted more area have been developed into a very in-ternation and distration reservoirs which, noted above are covered, here been years



One of the four huge exatrifaced pumps each of which can lift \$5,000 000 gallons per day against a head of 46 feet. The two suction mention are 26 inches and the one discharge nomine 86 inches in diameter. The impolars are 11 feet 5 inches in diameter. FILTERED WATER SUPPLY FOR THE CITY OF PITTINGUES

wing first to the sedimentation basin and thene to nowing first to the sequentiation pasin and there to the slow sand filters from which it is conveyed to a covered filtered water reservoir on the bank of the river. From the reservoir the water passes through two steel conduits laid under the river to the high service Brilliant I maying Station which lifts the water to th storage reservoirs that supply the distri n system of the city

the intake has been built back of a revetment which The intake has been built back or a reveniment waire, has been constructed along the river bank in front of the Ross station and it consists of a concrete chamber to which the river water is admitted by six teen four foot conduits arranged in two horisontal rows of eight each. From the intake the water passes through a 124 inch conduit for a distance of 280 feet to the pumping station

The Ross Point Station reasures 122 by 200 feet in The Ross Point Statin reseaures 138 by 300 feet in plan. The steam generating couplement consists of eight 356-horse power horizontal Starling water tube believe arranged in hateries of two each Estanding along the front of the building is a pump pit 82 feet wide and 16 feet deep in this are placed front wide and 16 feet deep in this are placed front constraints when the constraints of the constraints are compound confirming Coupling and the constraints are compound confirming Coupling Chaliners vertical cross-compound condensing Corlies engine likeh pump has a rated capacity of 35 000 000

istration building from which the entire operation of the plant is controlled and directed

There are three sedimentation basins the two larger

ones covering about twelve acres and the smallest about three acres. Water is carried to a depth of about three acres Water is carried to a depth of about fiften free than the total capachy is 310 600 000 gallons or about one days supply The 56 filten about one days supply The 56 filten have each a styles of one see and a capacity of 300 000 gallons per \$4\$ hours. Each filter bot mean trace 130 years for a complete process of the see and a capacity of 300 000 gallons per \$4\$ hours. Each filter bot mean supported by 170 columns seed hit inches series appeared by 170 columns seed hit inches series appeared by 170 columns seed hit inches series appeared by 170 columns seed hit inches series present it feet center to center The under firstances present it feet center to center The under firstances present it feet center to center the center to center the center for extending of center and the feet first center to center to center to center of years of the center to center with one for center of gravely varying from one fourth inch to three inches in stan, above which is a layer of cand four first thick an interesting features in the new system, for scenario to the present the tomost complete in filter downer. The work is done to machinery instead of the hand, and the system is the most complete in filter downer. The collector's beneath the filter jude lagel to condition in the application, and these gallones with the main conduct, which leads to the filtersh-spate report. about fifteen fret and the total capacity is 130 000 000 gallons or about one days supply The 56 filters

cral feet of soil which has been sedded Basedan road drives phasted with trees have been laid out an antural wooded slope at the being of the plant he born left unchanged. The whitvery of litered with the same begun entry fit 1990. The full squarker of the origin and litter was required to 1896, and with the construction of the hast top tilliers, and with the construction of the hast top tilliers with the same part of the same

trial Progress

The considerations are a Hook for the Atlantair Realist Light liting men the the same prorus, histories, challenger fit that your for the "Make's or and American schoolerse" Desartistics "Meetings". American schoolers by the property of the schoolers of the schoolers by the schoolers of the school

of the Motes Laboratory will be gied to receive any ong-thin department and will new for them, promotive to

## WANDERIES CERNICALS

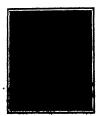
BY PROP SUPERIN HOLLIED CONTAINED STATE COLLEGE To cause two objects to change place that is, to me from one vessel into another and vice verse is s done by conjurers What is



CONTRICTO OF TURBS REPORT MEASURE

ormanos describe n of the magici intervention of the magician and the possibility benching the trick closely in full light. The vessues, ander are two periody transparent glass set tubes. Twere specialor can see that they contain nothing best for two substances about to change place. One of these is a flad, transparent, colorieus liquid which this blowt conclude of the tube. The other tube contains sawking best a walks, opaque powder Best tubes any given to soone skeptical specialorm, with the important plant that we happe well spart, one filter if each halm, and that the supprisenter about in resonator with the same and that the supprisenter about in resonator with the same of the same than the sam Date they be bught well spart, one thinks it such heaving and that the experimenter should resument without the highly she highly or solid in kept in the right or length she highly or solid in kept in the right or length she highly or solid she had been to she with his thambs and to shake them. After the grouppied with this request in well find that it two substances have appearantly chapted places, it was which contained a white contained a white contained a white contained as where finding the solid state is coloriest transparvate liquid and the it which contained as watery finded is now filled with

whice oncained a watery liquid is now niced with white opaque perfectly selid substance. Some curious and but little known properties of organic substances are used for this performance, of them is the property of salol to remain in the fusion state with such a tenacity (in open vessels). fusion state with such a tenacity (in open research presence of unlineed air) and for such a time fun-no other substance equals it in that respect, exis, periage the next againtime. Such is used in mostle fel-for some kinds of intentianl troubles and is sold af-vary druggriss. Some tong remaines of it are pillod into a clean and day test tube care being taken not to leave crystals substrain on the walls of the tube



CHITTIETH OF THIS AFTER GRANDING

The shoutherd is them medical over any fitnes (A con-lar will be say the fundam points of which is best of early printings (B). One input, it is bequest a tricke over the money point, so on, in Sink dary particles of maintening for the large "Their is them adversar to contain it in the large "Their is them adversar to contain it is the large that the large properties, over few, or think heart and maintening their Contrains of the angle for with their contains.

### Scientific American

tailimation but vigorous shaking for about ads invariably transforms the liquid into a lite mass. At the moment of the solidifica solid white mass. At the moment of the sol tion the cold tube instantaneously becomes hot

The property of suitd camphor to rapidly melt into a liquid compound whenever ground or shaken with solid chioral hydrate is used in the other test tube solid chloral hydrate is used in the other test tube the two chespitals must be findly produced and the campber is sprinkled with a few drops of alcohol be free being ground. The two white produces look atthe and are superposed in the tube two parts in volume of campbor being taken for one of chloral hydrate. The shaking rapidly intree and liquedes them Large tubes or bottles of any thickness can be used when the experiment is made in a hall. The fusion of salol is then produced in a water bath

# SEISSLER TURES FROM RELECTRIC LIGHT BULBS.

Many people have wished to perform experiments with Geissler tubes but owing to their high cost have not been able to do so. By the following simple and inexpensive method

anyone who possesses a one inch or larger induction cell can make a very good substitute for a Geissier tube from any of the standard electric light bulbs tube from any of the standard electric light bulbs Burnad out lamps or lamps in which the filaments are broken give the best resultá and can be had for next to nothing. The effect is much bester if the filament is broken into fine places, as it then does not interfere with the distance; in the bulb Metal filament end with the dandarps in the bulb Metal filament end to be bulb of the places, as it then does not interfere endarly be broken by striking the lamp with the hand bull in arrive lamps the filament is count times us tought in arrive lamps the filament is count times us tought in arrive lamps to be fully a striking the striking of the strik



Allowing just the right amount of air to leak in is rather difficult process but it can be done most ply as follows

simply as follows. Inside of making a wax cone as in Fig. II make a bell shaped piece as in Fig. III. With a sirry fill such a sirry district the size of the sirry will come. The purpose of this lick is to holp the spark puncture the sizes. It should not be made deep nough to allow any air to enter the bulb. Next stick the wax bell on the bulb no that the end of the wire rate in the bulb no that the end of the wire rate in the bulb not have the size for the size of current The spars will jump through the place and whatever air is in the boil will leak into the bulb By varying the size of the bell different colored glows may be obtained. The wax bell in Fig 111 shows about the size for the best results with 16-candle power lamps the sus for the best results with 18-candle power samps Different lamps give different results so that the exact size of the bell cannot be determined and striations are more or less a matter of luck. Almost every bulb made as above will show beautiful color effects each different from the other and the results are well

# CONSTRUCTION OF A SUMPLE ELECTROLYTIC INTERRUPTER.

The electrolytic current interruptor described here buy be used in place of the treublecome vibrator on part colin. It is to be operated on 50 to 200 volta

direct or alternating current The interruptions of circet or assertating current. The interruptions occurred that the type of interrupter are very high, being in the neighborhood of 1000 per second. The selectroites and electrodes are contained in a wet battery jar. A wood plug should be turned to

wer battery jar A wood plug should be turned to fit tightly in the top of the jar and bolled thoroughly in parafin to protect it from the acid fumes. A glass tube 6 inches long with an internal diameter of ½ inch should be procured and a hole slightly larger than the external diameter of the tube bored through than the external diameter of the tune nored through the center of the wood cover The tune is hild in posi-tion by a heavy brass spring pressing against it For the anode a 1/2 inch round brass rod should be straight-



A SIMPLE REMOTROLYTIC INTERPUPTER

and so at to allow very easily through the giase tube of the one and of the red should be spared off and the other and threaded and a taped brase hall fitted to it. T is weight br as validation freeds the red into its solution as it is used. One side of the ball should be taped and fitted with a binding next for connecting pur poses. The extincide consists of a local strip it by it by poses, the extincide consists of a local strip it by its consists of the extincident of the control of the contro ened so as to slide very easily through the glass tube One end of the rod should be squared off and the other a third full with a 10 per cent solution of subparts, or after as of piece to wood cover on furth leaves the gissa tube through the hole will it is ½, is the from the bottom of the Jar and thighten the spring against it. Then put the root through the sizes cross rife if it is testing on the bottom of the jar in use when the cleaning through the apparatus we alwards were considered to the piece of the piec a third full with a 10 per cent solution of sulphuric intended for continuous work the electrolyte another be cooled by running water through a coiled glass tube in the bottom of the jar This interrupter will successfully operate coils from the small sizes up to the 10 inch airs and is especially desirable in wire loss telegraphic transmission as it side materially in the production of a penetrating high frequency wave

### DEVICE FOR TESTING ELECTRIC WIRING MT IS WARD IS NO HOLD

In testing electric wiring for open circuits grounds or short circuits it is often necessary to skin the in sulation from the wires under test in a number of places so as to connect them to a magneto or off testing device. The accompanying illustration sho



TESTING MEEDLE FOR INSULATED WIRE

a device which does away with this mecessity for it a device which does away with this no centry for it meaning a lamb and processing the processing a second and a second and a second and a second a ed sewing needle which is driven through the plug as shown in the sketch. The eye end of the nee is soldered to a length of lamp cord which is pas

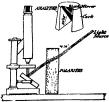
through the handle as shown. The plug is then driven into place and the testing handle is ready for use

# POLARISCOPE ATTACHMENT FOR MICHOSCOPES.

Illustrated herewith is a bit of apparatus by m of which polarised light may be used with any micro scope without changing the instrument itself. The polarizor consists of one doz n 4 x 5 inch glass negatives which have been thoroughly cleaned and dusted. and are contained in the original box, which has its top and bottom cut out, leaving just enough card around the edges to hold the plates in position

The analyzer comprises a piece of blackened cork with a wedge-shaped slot cut in one side and a bit with a wedge-snaped and cite in our sine same and of black mirror fruity present into position in the sint at the polarising angle. This rests on the eye-piece of the mirroreops and may be turned at any angle in the horisontal plane. The black mirror is made of plate glass or cover glass, coated on the back with a mixture of lampblack and shellar variable or, it comes convenient lampsack and sine. The draw if more convenient, lamputack and give. The draw ing shows the arrangement of the apparatus with Nicola' crossed. A small scale may be attached to the top of the analyzer, so that the angle through which it is turned may be noted

This scheme may also be applied to a simple, or ecting, microscope For simplicity and cheap combined with a high degree of efficiency, I do not



MICROSCOPE ARRANGED AS POLARISCOPE.

think this apparatus can be excelled. The pl to be derived from its use is infinite

AN ELECTROPLATING OUTFIT

Those who wish to indertake the electro-deposition of metals upon a small scale whether as a business or for pleasure will find that the apparatus and utensils isors described will meet the ordinary require-

The photograph reproduced herewith shows the wooden depositing tank and battery of an outfit in actual use. The battery cells are made exactly as explained on page 445 of the Scientisto American of

The depositing tank is made in the same way, with the exception that the joints are put together with a very thick India rubber cement of the kind used for airing tires The woodwork at the joints is first coated with the cement, both at the grooves and the ends, and is allowed to stand for an hour or two, when it is coated again and put together either with ualls driven in diagonally or with screws. The ex-cess of rubber must be wiped off. In the course of about twenty four hours the inside of the tank must about twenty four hours the inside of the tank must be coated with a burning bot solution of parafin. I'n less the parafin is very hot, it will not penetrate the pores of the wood sufficiently to make it impervious to any of the chemical solutions that the tank may to any of the ceminal solutions that the tank may contain the wood used in making a depositing tank must be well seasoned if possible use old boards one inch thick so that when planed the board is not less than sever-eighths of an inch thick, and at all times place cleats across the bottom, so that it will stand clear of the floor or work bench. The rubber comment used for the joints will not be affected by any of the depositing solutions. The tank illustrated measthe depositing solutions The tank illustrated measures 51/2 inches wide, 121/4 inches long, and 11 inches ures by incare wice, 12½ inches long, and 11 incare deep. Five such tanks as these should be made, to contain the following cold working solutions, for all tor, nickel, brass copper and size Gold and alkaline coppering solutions must be worked hot, as will presently be described

- Dissolve 21/2 ounces silver in a Biller Reiting- Dissolve 31g ounces silver in a giasa flask by adding 1 ounces intrice soid and 1 ounce distilled water. Heat the flask slightly and place its where the red alterna times will use and its to a flue, or out of doors. When the aliver has become dis-solved, add a quart of distilled water, sit the nut-ture well, then add gradually about 5 fluid ounces pre-hydrochlor soid, striving the mixture well with a giasa rod. Place the fluid is a fluid ounce of the white predictate (salkytik) of sliver) is settling, the white predictate (salkytik) of sliver) is settling. Four off the clear liquid, add shother quart of water; stir well, allow it to actile, decent; and weath a third time. This will free the precipitate of impuritive formed. Dissolve % pound organide of potassium in % gallon of distilled water When completely de-½ gailon of distilled water When completely dis-solved, add a small quantity at a time to the chir ride of silver Stir this well, and continue to add the cyanide solution until the chloride of silver has the cyanide solution until the chloride of silver hiss only just been dissolved. Allow a little time to elapse between each addition. When all the chloride of silver is dissolved make up the quantity to 3½ gallons with distilled water This will be the right quantity to fill the wooden tank, with one ounce silver to the gallon Let this solution stand for twenty four hours, so that all dirt will settle, and the pour the clean solution into the tank. The solution

is now ready for use. o sheets of fine silver about 5 inches square must Two sacets of mas silver about a locuse square must be used for the anodes, suspended by either copper or silver wire hooks upon the copper rod (shown in the illustration) attached to the wire from the carbon of the battery, while from the bent copper rod the articles to be plated must be suspended, this rod be-ing attached to the since of the battery. The articles to be plated must be cleaned by boiling them in a strong solution of common washing sods for twenty minutes, rinsing in water, and scouring them indi-vidually with a stiff nail brush dipped in pumics powder or brick dust. Articles of German silver brass, or copper, after scouring and being attached brass, or copper, after accouring and peans attached to the slingfug wire, must be dipped into a solution of one ounce of nitrate of mercury in a gallon of water This will give a chemically clean surface and cause the sliver to adhere firmly when the deposit takes place in the silver bath. Threet or first apon or fortis should be submarged in the pinting limit quickly, before the made of others in many the this conducting the made of others in many the side of it. 1910 and 1910 and 1910 and 1910 and other in the side of the side of the side of the side of it. 1910 and 19



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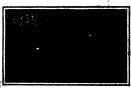
Copper Flots: Articles and Copper Flots: Articles and Copper Flots: Articles and Copper Flots: Articles and Copper In S. Articles and Copper In S. Articles and Copper In S. Articles Cop mula given Dissolve ¼ pound sulphate of copper in ¼ gallon hot water Also ¼ pound carbonate of pot ash in 1 quart of water, and about 10 ounces cyanide of potassium in 1 quart water. Add the cart or potassium in I quart water And the earponate of potash solution to the sulphate of copper Sitt the mixture well Add enough strong liquid ammonia to dissolve the precipitate Then add gradually the cyanide solution until the blue color disappears.

Make up to 2 gailons with distilled water, and after stake up to 2 gainons with distilled water, and arrest allowing the sediment to subside, pour off the clear liquid into the depositing tank. Have two anodes after inches square using the second anode according to the number of articles to be plated. The two battery cells above referred to will perform all the work of deposition that this article describes. The cleaning of small iron or steel articles should be done just as described above for allvering. When the articles are coppered they must be scratch-brushed before receiving a deposit of nickel, silver, or gold; then secured with fine pumice and water. They will then take a ne deposit of these metals.

Gold Plating —Electro-gilding in a small way is

best done by making the gold solution as follows Dissolve in 1 quart of hot distilled water 1 curies of Dissolve in 1 quart of not custume vater; course, correct or coverage of the c of separat where it can all manners, then have been pot. Attache that where to their heart and the hard and the hard and the pot. Attache that where to their heart and the secondar from the outlent of the mental of the country. Note the first part of the method only of the respect to the method only of the secondar from the proper and allow the nestine of the few orders or combining the property of the secondary of the secondary of the secondary that the proper of the proper paid. Remove the proper not, throw aware tents, use the remeating liquid for the gold in an and the states of sheet gold one is to used. tents, use the remarking lightly for the gold diggst ing, and the piece of pheet gold can be used by anothe. Any article after bring well cohance—and control with sold in this bath, string a very relative Rails beer is the best liquid to nee with a signi-ture of the sold of the sold of the sold of the brush in brightnening the desposit pievious to bright ling. The brans wire brush used should be finge' gold than for either. The articles after rinning show be direct in the brush out and the sold of the Size Piecing—Articles on resulty be contest, we kine by using the following solutions (Watter year). 3th saudous water. I sound countries of

sine by using the following solutions (Watt's proje-es) 34; gallons water, I posted cynaide of poise-sium, 10° ounces of 0.888 ammonts. Place this in one of the quits. Fill two large porcus pots with a plain cynaide solution, consisting of 4 ounces of potassium cranide to I quart water. Place a strip of sheet cop-per the width of the porcus pot in seeh, and connect the copper with the batter; as for gold, using two large clean who pitchs in the ammonia cranide solution until about 6 ounces of sinc have been dise Remove the porous cells and throw the contents:



COMPLETE OUTSIT FOR ELECTROPLATING.

ate of potash, stir until di set the liquid stand until the dirty matter has subsidied and then sighted pif the bear to be a subsidied with the stand of the sight of the stand of the sight of the stand of the sight of the stand is the stand of the stand o bet the liquid stand until the dirty matter has subsided

assium dissolved in half a gailon of warm wa tassium dissolved in haif a gailon of warm water, by pounds carbonate of potash dissolved in ½ gal-water, 2½ counces acetate of copper dissolved in 1 quart water, 5 counces sulphate of sinc dissolved in

I quart water, be concess suphate or sine dissolved in \$\frac{4}{3}\$ gallon hot water Let all the solutions be cold be-fore mixing. Add to the acctate of copper solution \$\frac{4}{3}\$ pint strong water ammonia, 0.880 Just before shall mixing, stir this well and add to it the sine solu is plint strong water sammonia. O.880 Just before main mixing with the well and add to it the sine solution, toesther with smother is, plint strong ammonia, and and the control of the co

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piere, no that it is rendered more palatable, and which impurities are renoved from the MUDICINAL. PHERBARTON—C. Himmuns, New York N. Y. The object of this improvement is the provision of a simple and the control of 
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MANGARIME STREET MAILS

rails used by the Boston Elevated upon the current series of course, an expensive process in fact, this corporation rail conts about \$5 per foot for the rails. The ord nary rail costs only about 38 cents foot, or only 1/3 as much. But even then it is regarded as a good investment, because of the very long life. In the au tumn of 1908 the company had in service tumn or 1908 the company had in service 476 feet of this rail in addition to three crossing frogs and a number of ordinary frogs. Its experience is certainly worthy of attention However, if manganese steel can be rolled to advantage, we may steel can be rolled to advantage, we may expect a still better material at a lower figure. In fact, such rails have been rolled to sell for about \$200 per ton, or about \$2.50 per foot (about 85 pound sec tion).

Perhaps expense of rolling manganese-steel raits is due to the considerable piping to which ingots of this material are subject, requiring thus a large discard or special means of prevention On the other hand, considerable blow holes are thought to be infrequent, if they occur at all This is attributed to the high percentage of substances which have a stronger affinity for oxygen than iron This will be bet ter understood, perhaps, by considering

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Bome of the difficulties of rolling this motal have been given by Mr W 8 Pot ter When the temperature has fallen as low as about 1,300 deg F. 1t becomes approximately the continuous and the second of the second o low as about 3,000 deg as 1.0 miles as along a second of the second of t cracking for the reason that then the steel will be put to crush in the mill Apparently, the upper limit beyond the steel will be the steel that the steel steel the steel will be steel that the steel steel steel that the steel s it may be that manganess steel may cool somewhat more slowly than the ordinary rail steel. But we cannot expect the difference between 575 deg and 900 deg to be thus made up. So that, if we should proceed by the usual methods, we would be unable to secure our desired result. However, manganess steel has been suc-cessfully rolled in France, in England, and in the United States.

TABLITONE ARROPLES FLIORY
(Ontinued from page 52!)
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where the sirved the road at South Minabeth, and rollowed in practically all the way to Philadelphia The special train, bearing a white streamer on the roof of the foremost car, soon located him and caught up with (Continued on page 595.)

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delphia was reached he the train and, before aligh two large circles above the field that was his dostination The greater part of the trip ilamilton w at a comparatively slight elevation

-about 200 feet Even in passing over the city of Trenton he rose to only douthe city of Truston me rose to only un-ble this height, as he preferred to take the chance of his motor stopping and of his being obliged to descond rather than to cut down his average speed by rising to a great elevation

The various cities and towns along

the route were passed upon schedule tim

After reaching the field at North Phila delphia and circling about a couple of times Hamilton alighted gracefully at 9 26 A M, just 1 hour and 50 minutes from the time he started If a deduction is made for the circling about at the start and finish, the actual time of the flight was about 1 hour and 45 minutes was about 1 hour and so minutes 2 no airline distance is 747 miles from Gov-ernor's Island to North Philadelphia, but ernor's Island to North Philadelphia, bott over the route followed by Hamilton it was 839. The average speed, therefore, with the time of the circlings de-ducted, was 4737 miles an hour, or 45.83, using the full time in tother words, Man-istand in New York harbor and traveled to North Philadelphia in considerably to North Philadelphia in considerably to the philadelphia in considerably journey by boat to Jersey City and

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After being greated by Governor III art and delivering to him the meaning as shown in one of our illustration Hamilton redilled his fuel and oil tank spite the fact that the train was at the fastest possible speed-\$4 an hour or more-its occupants did no catch sight of Hamilton until 22 min cates signt of Hamilton until 38 minutes after they started, while it was about 10 minutes later before they finally over-hauled him, 2 miles beyond Princeton Junction and 39 miles from the start. Thirty-seven miles had been covered by the special in 34 minutes, including a stop of 2 minutes at Bristol caused by an express train being in the way. The as express trait being in the way. The train and servicine traveled abreset of each other for a white, and finally Han-ilton dropped slightly behind He had-covered the first 38 miles of the return formers at the rate of 51.3 miles as how, thus making the fastest cross-country fight yet accomplated at the small vil-lage of Patinaboro, 41 miles from North lags of Patinaboro, 41 miles from North Philadelpias, Hamilton again few overthe tracks a thousand feet or me the tracks a thousand rest or more much of the train. The heavy clouds of amoke from the locomotive caused him to seek a higher elevation, and he rose to a height of about 800 feet. Soon after crossing the Raritan River the occupants crossing the Haritan River the occupants of the train were surprised to see Ham ilton turn off to the right and pass out of view It seems he mistook the river for the Kill von Kull, and started, of Or the Chill con Kull, and started, of course, where the course is a second of the course of course of the course his setting this propeller—which, by the way, was the one that Curties used at Rheims in the Gordon Bennett race—but a soon as it arrived Manifort immedi stair put it on and started once more, at 6 if P M. As the propeller was cracked and land been patched up with these tig. Himilton feared it might break before he could complete his con-traction of the contraction of the con-traction of the contraction of the con-traction of the contraction of the con-traction o ney He therefore rose to a consid-height—about 1,500 feet—and ms wide circle over Elisabeth While and made a wide circle over Ellasbeth While above the city the engine again started miss lng and running on but six cylinders Fortunately, however, his height was suf-ficient, so that he just succeeded in mak-ing Governor's island during the course ded in makof his long descent. The 19% miles air-line distance from South Ambor to the Island was covered in about 23 minutes, and he finally alighted in front of the shed at 6 40 P. M

In addition to this being pr stest cross-country flight ever exe amilton's performance was a spe fastest cross-country fligar ever executed, Hamilton's performance was a spectacular one, since the flight was made over water, cities, and open country. Whem news was recovered at New Tork that he had started on the return trip, thousands of people anthered at the Rattery expecting to see him arrive at Governor's as and at about 15 p M. When word cane that the had been control assignment of the control of t pointed that he was unable to make the return typ, without a nep, 250 wester have been able to do that had it not her for motor troubles. Let far as the seco-plane itself was someomed, this was with Constitution on judge second.



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ded according to the seaport from

points are Knyujack, Alden, and Azisick The different brands of course vary ac cording to the purity of the emery—the

larger the amount of oxide of alumina,

The American emery is mined near Peckskill, New York State. Some very excellent one has been taken out at that place but the bulk of the emery is high

in odds of from and therefor soft.

Flore is also a small deposit in the State
of Kansas, but the deposit is insignificant and the quality of the enery of an
interior character.

The following are the physical proper ties of emery. Color black of blue black,

specific gravity, 0 1050 ounce. It is thus placed in scale of hardness. Pure Naxos

84, pure lurkish 84, pure American 84 (the diamond being to 10) In its manufacture the emery passes

the machine, and the aviator mas sugreshed the opinion that some miss-tins piston rings in one gr typo of the cylinders allowed oil to escape by the pigion and foul the spark plugs. There was no interruption in the sparking cur-rent supplied by the high-dension Bosch magneto. At any rate, Hamilton's flights showed the noutbility of securion—"". magnets. At any rate, mamners mignate showed the possibility of carrying mail and important dispatches, and it is interesting to note that Representative Shopherd of Texas has introduced a bill into Congress calling for the investigation o Post Office Department into the sero to for the purpose of carrying mail Also a few days after Hamilton's flight, the French war authorities com manded M Blériot to carry a message from the camp of Chalons to Paris, which he did promptly in his monoplane with out any mishap. During the present week Hamilton is to experiment for the government at Nashville, Tenn upon the dropping of explosites from his machine These experiments will be extried on dur

The flights of Cuttles and Hamilton have spurred many budding aviators attempt in the near future some of the cross country flights for prizes, and new prizes are being offered almost daily for such feats. We wish to remind such avi ators that they stand a chame of win ning the Scientiste Augusta Trouby if they send in their cutiv to us or to the Aero Club of America twenty four hours In advance The aviator making the long est cross-country flight this year will win the trophy for 1910

EN WALTER C COLD

There are three qualities of emery used in this country-Naxos or Greek, Turk ish and American

The Naxos brand is import island of Naxos (Grecian Archipelage) island of Naxos (Grecian Archipolago) Gresco, the mines being controlled by the Grecian government Naxos emery contains a large percentage of slumina, (about 56 per cent) This emery has a most excellent fracture, the grains being very hard and very sharp, and therefore) very hard and very sharp, and therefore especially adapted for use in grinding wheels. These characteristics prevent its use, to any extent, for polishing pur-pages, as it neither "breaks down" nor granulates under pressure of the work, as do the other qualities of Crurkish and American) An ideal emery for polish ing must present new cutting points cor The Naxos grains are so hard and sharp that it does not properly gran ulate, therefore it is not a desirable pol-ishing medium, except for certain special classes of work. Naxos emery, owing to its large percentage of alumina, follows corundum in the scale of hardness

occumbum in the scale of hardness Good Turkins emery contains any where from 15 per cent to 25 per cent cated of from (the larger the per centage of oxide of iron, the softer is the emery) and it is used therefore or clusterly as a polisher on "hard work." Turkish somery has a good fracture, and is just tough enough to make it ideal for

dishing purposes.

American emery contains about 45 per nt oxide of Iron, and is therefore the softest emery produced, yet is succe fully and largely used for certain class of "noft work."

Most of the Naxos and Turkish emery brought to this country comes in piece brought to this country comes in pieces ranging from the size of a marble up to \$5 or 30 pounds in weight. Formerly it was brought over as ballast in ships, but It became such an important con dit it became such an important commontup commercially, that during the last quar-far century it has been transported across the water as regular cargo. Turkish em-tery is brought to the assports of Asia my prought to the samports of Asia Milhor in the same primitive fashion which has exhited for many years—on the back of dample. There are no up-to gate mining methods. The one is taken



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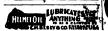


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